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Event and Comment.

The Royal Visit.

AN outstanding impression of the visit of His Royal Highness the Duke of Gloucester—one of the most notable events of the month of December—was his keen interest in country life, its industries, and its people. At Terrica he saw something of station life and work among sheep and cattle, and of the high standards attained in the several branches of animal husbandry as practised in Queensland, and of which Terrica provided typical examples. The temperate fruit lands of Stanthorpe and their evidence of skilful farming as applied in modern orchard practice had also an especial interest for the Duke. The blood stock studs near Warwick and the vast wheatfields of the Darling Downs attracted his close attention, while the lucerne lands of the Lockyer—a glorious picture after recent rains—and the wealth of the parallel dairy and diversified farming country also obviously impressed him. At the Queensland Agricultural High School and College at Gatton the Royal visitor met future leaders of rural industry in Queensland at a big parade of students, of whom 282 are in residence. The college and its curriculum embracing the science and practice of agriculture and animal husbandry plainly impressed His Royal Highness, and in subsequent conversation with His Excellency the Governor, Sir Leslie Wilson, he expressed his pleasure and great interest in what he had seen. At

Buderim, too, the Duke found much to interest him during the following week-end in the highly cultivated fruits of that rich region, which within a single generation of Queenslanders has emerged from the primitive to the practical—from pathless jungle and rain forest to productive citrus orchards, banana groves, coffee plantations, and pineapple gardens. To the Royal visitor, these rich fruit lands and their cocoa-coloured soil in cultivated orderliness vied in challenging charm with the brilliant sunlight, the tumbling surf on golden beaches, and the scenic beauty of misted mountain, wild woodland, and the open ocean as blue as the Mediterranean.

At the Showground in Brisbane there was presented to the Duke an array of primary products and stock exhibits that constituted a microcosm of the rural industry of the whole State, and with which the Duke was no less impressed. In his reply to the address of welcome, he said to a large assemblage of farmers and other citizens:—

> "I thank you for the words in which you have expressed sentiments of loyalty to the King, my father, on behalf of your members, who include men and women engaged in every form of agricultural and industrial activity in this great State. The King, as a farmer and stockbreeder himself, will greatly appreciate these assurances of loyalty, coming as they do from fellow farmers across the world, whose exhibition he has himself had the pleasure of opening.
>
> "I am glad to be the fourth member of my family to be the guest of your association, and I am most grateful for the cordial welcome and hospitality which you have extended to me to-day. I have been much interested by your record of the association's activities and products, and of the extent to which those products are disposed of within the Empire. This wonderful arch shows me not only their variety and range but their quality, and it enables me to realise more clearly that this is a State of great achievement and of even greater promise. I only wish that time permitted of my seeing all the districts whose products are exhibited here, and of personally offering to the producers my congratulations and good wishes. I ask you to do so on my behalf, and I assure you that I shall carry away from Australia very pleasant recollections of my visit here to-day."

A Great Work.

AT the Diploma Day function of the Queensland Agricultural High School and College, His Excellency the Governor, Sir Leslie Wilson, said that he regarded the college as the most important educational institution in the State. He emphasised that to Queensland agriculture was of vital importance. From the earliest days agriculture had been the foremost of the industries of the world. Those who went on the land to-day were gaining a fine and full life and a realisation that they were doing men's work—a work well worth doing; a great work for their State, country, and Empire. The strength of Britain came from her yeomen, and he hoped that those who went on the land to-day would, like the yeomen of England, be ever ready to do national service for their country should the necessity arise.

Country Consciousness—An Appeal by the Premier.

AN earnest appeal to all parents who had boys available for work on the land to interest themselves in the opportunities offered by land pursuits was made by the Premier, Hon. W. Forgan Smith, at the Diploma Day ceremony. Mr. Forgan Smith, whose own son is a student at the Agricultural College preparing for a country career, said it was their duty and privilege to enter manfully into the possession of their great agricultural inheritance. It was their duty to cultivate the land and develop the State, and to do that they must get the aid of all intelligent people. Queensland for all time must be an agricultural country, and her future depended on the use they made of their opportunity. In the last analysis the only title to hold land was to put it to the best use. History showed that if they did not adequately develop it they might be compelled to make way for other people who would make better use of the land. The difficulties that beset the world were not outside the scope of man's own control. They could not in Australia complain that they lacked the essentials for building a great civilisation. It was up to them to use their collective intelligence so that the resources of Nature should be made available to all industrious people. In that direction people must become more ''land-minded'' than at present. He viewed with very grave misgiving the fact that while a number of youths were unemployed in all the great cities and work was available for them on farms it was difficult to fill those positions. Life on the land could be made attractive.

Put Boys on the Land.

MR. FORGAN SMITH added that the most impressionable period in life was between the ages of fourteen and twenty-one. During that period the habit of application to honest industry must be obtained. If a boy or girl did not get that training in industry or in habits, then he feared that their future would be poor indeed. It was their duty to develop Queensland's inheritance in land that they might be deemed worthy descendants of the country's pioneers. To do that they must settle this land with our own people and with our own boys. The problem of boys in industry was associated with the question of employment generally. It had been suggested that conditions were such that employers were not permitted to engage as many boys as they might like. But in skilled industries very few employers had as many apprentices as the law allowed. That was a serious position from a State point of view. Boys should be given the opportunity of learning trades for their own sakes and the sake of the nation. When normal times arrived there must be boys properly equipped for those trades. It was necessary that the minds of boys and girls should be turned to land, and land occupations, and that the intelligent co-operation of all interested in obtaining employment for the large number of boys and girls leaving school every year should be received. Everything the Government could do towards encouraging more employment of youth would be done, and he hinted that more would be announced on that subject shortly.

The Minister's New Year Message.

To the

FARMERS OF QUEENSLAND

SLOWLY but surely the world is emerging from the clouds of depression and is thinking of the more prosperous days ahead, but clear thinking and good leadership are essential if these hopes are to materialise.

Good leadership for those engaged in primary production was never more essential than to-day, for the problems arising from economic nationalism have already exercised a disturbing influence in our overseas trade in primary products. What then is the solution? The answer is not difficult and may be expressed in one word—co-operation. This implies the fullest and closest understanding of the nature of problems, and the intelligent application of this knowledge. We may take heart, however, that so far we have been able to resist restriction of production with all its evils, and have presented a unanimous opinion against such proposals. I earnestly hope that this attitude will be maintained during the difficult months ahead. The formation of a Federal Economic Agricultural Council will become the mouthpiece for the hopes, desires, and aspirations of our farming community, and the future is therefore fortified by the fact that at last Australia will speak with one agricultural voice.

I thank you all for help given to the Department during the past and, on behalf of the Department, wish you all a Happy and Prosperous New Year.

Frank. W. Bulcock

Codling Moth Control by Non-arsenical Sprays.

By HUBERT JARVIS, Entomologist.

DURING the last few years the use of arsenic in any form for the control of insect pests affecting fruits or vegetables intended for human consumption has become increasingly unpopular. Accordingly, with a view to finding a satisfactory substitute for arsenate of lead for the control of codling moth, experiments were carried out in the Stanthorpe district in the 1932-33 season with certain non-arsenical sprays. Interesting results were obtained which indicated the possibility that the use of arsenate of lead was not necessary in controlling this pest and, in order to confirm or invalidate these results, the experiment was repeated with certain additions and modifications during the 1933-34 season. The information obtained in this additional experiment is detailed in this report, the results of the earlier experiment having been published in the July (1933) issue of this Journal.

The Experimental Plot.

The orchard chosen for the experiment was situated in the Summit section of the district, and was separated from surrounding orchards by fairly large areas of scrub land, thus being more or less isolated. The codling moth infestation in the orchard during the previous few years had been fairly heavy, and it was thus considered very suitable for the work in view. It was realised that a late-maturing variety would give the fairest possible test for codling moth control, and accordingly the variety Granny Smith was chosen, because the apples would remain on the trees throughout the season until about the end of March. The plot comprised seven rows of trees, there being four trees to each row. The trees were all small, and the crop light, some trees carrying only two cases of fruit.

Materials Used and Mode of Application.

The treatment of the trees in the plot was as follows:—

Row No. 1—Trees 1 and 2 controls untreated; trees 3 and 4 barium fluosilicate.

Row No. 2—Trees 1-4 nicotine sulphate-white oil, but trees 3 and 4 given a calyx spray of arsenate of lead instead of the other insecticide.

Row No. 3—Trees 1-4 katakilla-white oil, with calyx spray as above.

Row No. 4—Trees 1-4 white oil 1-64 with calyx spray as above.

Row No. 5—Trees 1-4 white oil 1-100, with calyx spray as above.

Row No. 6—Trees 1 and 2, arsenate of lead; trees 3 and 4, controls untreated.

Row No. 7—Trees 1 and 2, potash soap; trees 3 and 4, katakilla.

In the case of the trees in Rows 2, 3, 4, and 5, however, the final spray applied on 15th February was white oil at 1-80 strength.

Barium fluosilicate was used at a strength of 1 lb. to 40 gallons; nicotine sulphate-white oil at the strength nicotine sulphate 1-640 and white oil 1-80. Katakilla-white oil was used at a strength of katakilla 2 lb. to 32 gallons, with white oil 1-80. White oil alone was used at 1-64 and 1-100 strengths. The arsenate of lead strength was 1 lb. to 40 gallons, except in the case of the calyx spray, which was double that strength, and the potash soap was used at a strength of 2 lb. to 32 gallons, katakilla also being used at 2 lb. to 32 gallons.

Five treatments were given in each case, and the spray was applied with a knapsack spray outfit fitted with a special spraying nozzle, enabling a very fine mist-like spray to be obtained. Approximately half a gallon of spray was used for each tree at each application, and each tree received a very thorough covering. All sprays were applied during sunny weather, and rain occurred very soon after the first four treatments. The cost figures are based on the local prices of the materials used.

Weather Conditions.

The rainfall, as will be seen from Table I., was heavy, being the most abundant for many years, and conditions were exceptionally favourable for the growth of the trees, although the excessive flow of sap may have been a factor contributing to the abnormal shedding of fruit, which occurred in the experimental orchard and generally in the district in the very early stages of development.

TABLE I.

STANTHORPE RAINFALL, 1933-34.

October, 1933	318 points
November, 1933	541 points
December, 1933	514 points
January, 1934	406 points
February, 1934	260 points

Seasonal Incidence of Codling Moth in the Stanthorpe District.

The codling moth was more troublesome in most orchards than was the case during the previous season, and many growers lost fairly heavily owing to this pest. This increase of moth was in great measure due to the wet conditions experienced preventing the application of sprays with a power spray at critical times, owing to the boggy nature of the orchards.

TABLE II.

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

Date of Application.	No. of Trees Treated.	Materials Used and Strength.	Quantity of Insecticide in Ounces.	Quantity of Spray Fluid in Gallons.	Cost per Application.	Total Cost.
					s. d.	s. d.
1933.						
25th October..	2	Barium fluosilicate 1 lb. to 40 gallons	½	1	Not available	
16th November	2		½	1		
20th December	2		½	1		
1934.						
18th January	2		½	1		
15th February	2		½	1		

TABLE II.—*continued.*

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

Date of Application.	No. of Trees Treated.	Materials Used and Strength.	Quantity of Insecticide in Ounces.	Quantity of Spray Fluid in Gallons.	Cost per Application. s. d.	Total Cost. s. d.
1933. 25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	1 8½
25th October	2	Nicotine sulphate 1·640, White oil 1·80	Nicotine sulphate ½ oz., White oil 4 oz. Each application to the four trees	1	0 2½	
16th November	4			2	0 5	
20th December	4			2	0 5	
1934. 18th January	4			2	0 5	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933. 25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	1 10
25th October	2	Katakilla 2 lb. to 32 gallons, White oil 1·80	Katakilla 2 oz., White oil 4 oz. Each application to the four trees	1	0 2½	
16th November	4			2	0 5½	
20th December	4			2	0 5½	
1934. 18th January	4			2	0 5½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933. 25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	0 11¾
25th October	2	White oil 1·64	White oil 5 oz. Each application to the four trees	1	0 1¼	
16th November	4			2	0 2½	
20th December	4			2	0 2½	
1934. 18th January	4			2	0 2½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933. 25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	0 8¼
25th October	2	White oil 1·100	White oil 3 oz. Each application to the four trees	1	0 0¾	
16th November	4			2	0 1½	
20th December	4			2	0 1½	
1934. 18th January	4			2	0 1½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933. 25th October	2	Arsenate of lead. Calyx spray 2 lb. to 40 gallons. Cover sprays 1 lb. to 40 gallons	1	1	0 1	0 3
16th November	2		0½	1	0 0½	
20th December	2		0½	1	0 0½	
1934. 18th January	2		0½	1	0 0½	
15th February	2		0½	1	0 0½	
1933. 25th October	2	Potash soap 2 lb. to 32 gallons	1	1	0 1	0 5
16th November	2		1	1	0 1	
20th December	2		1	1	0 1	
1934. 18th January	2		1	1	0 1	
15th February	2		1	1	0 1	
1933. 25th October	2	Katakilla 2 lb. to 32 gallons	1	1	0 2	0 10
16th November	2		1	1	0 2	
20th December	2		1	1	0 2	
1934. 18th January	2		1	1	0 2	
15th February	2		1	1	0 2	

Results Obtained.

On the data secured during the seasons 1932-33 and 1933-34, it is evident that arsenate of lead is not necessarily the most effective insecticide for the control of codling moth, and indeed the nicotine sulphate-white oil combination during both seasons gave a higher percentage of control than arsenate of lead. The katakilla-white oil spray, although fairly satisfactory as regards codling control, caused very considerable loss through scorching of fruit and foliage. Katakilla alone was quite unsatisfactory. White oil at 1-64 and 1-100 strengths was disappointing in this experiment. Potash soap gave decidedly interesting results, and further work with this spray seems justified, as it was the second cheapest non-arsenical spray used, and gave 80 per cent. sound fruit.

The efficiency of the nicotine sulphate-white oil combination renders it a very promising substitute for arsenical sprays, in spite of the fact that it is more expensive. There is, moreover, a considerable amount of experimental evidence that the nicotine sulphate-white oil combination as used in this experiment has a definite value as a fruit-fly repellant, and thus its value is very greatly enhanced. Some consideration has, however, to be given to possible cumulative ill effects of repeated applications of oil sprays, this being a point on which it is hoped to obtain evidence in the near future.

The figures showing the value or otherwise of the substitution of an arsenate of lead calyx spray for the other insecticide were certainly interesting, for although in three instances a slightly higher percentage of sound fruit was obtained where an arsenate of lead calyx spray was substituted, the difference is not nearly so great as was expected. It is, of course, almost universally believed that the calyx treatment with a double strength arsenical spray is of paramount importance.

TABLE III.

CODLING MOTH INFESTATION AT TIME OF PICKING.

Treatment.	Total Number of Apples.	Sound.	Per Cent.	Unsound.	Per Cent.	Codling Infested.	Windfalls.
Barium fluosilicate	400	222	55·5	178	44·5	178	39
Nicotine Sulphate-White Oil	532	500	93·9	32	6·1	32	25
Katakilla–White Oil	292	225	77·1	67	22·9	67	31
White Oil 1·64 ..	537	375	69·8	162	30·2	162	35
White Oil, 1·100 ..	359	250	69·7	109	30·3	109	43
Arsenate of Lead..	266	225	84·6	41	15·4	41	23
Potash Soap ..	250	201	80·4	49	19·6	49	19
Katakilla	434	225	51·8	209	48·2	209	54
Controls	1,077	275	25·6	802	74·4	802	106

Acknowledgments.

Thanks are due to Major Letters, of the Summit, who very kindly made available his orchard for the work, and who rendered much assistance during the progress of the experiment. Thanks are also due to the Chief Entomologist, Mr. Robert Veitch, for his valuable co-operation and advice.

Pineapple Wilt Disease and its Control.

By H. K. LEWCOCK, M.Sc., B.Sc.Agr., Assistant Plant Pathologist.

NO other problem of pineapple culture has proved more difficult of solution than the prevention of wilt. Pineapple wilt is not a specific disease; as generally used the term refers to a type of plant failure which may arise from a variety of causes. Since the actual cause of wilting in pineapples is not always readily apparent, a certain amount of confusion exists amongst growers concerning the various types of wilt, their identification and their relative importance one to another.

PINEAPPLE WILTS OCCURRING IN QUEENSLAND.

In Queensland, the term "wilt" is commonly applied to failure of pineapple plants resulting from the attacks of three separate and distinct root-destroying organisms, any two or all three of which may occur together in one plantation. These root parasites are: (1) Nematodes (*Heterodera marionii*), (2) White grubs (*Lepidiota spp.*), and (3) Pathogenic fungi (*Phytophthora cinnamonii* et al.). In Hawaii, the pineapple mealy bug (*Pseudococcus brevipes*) has been found to induce still another type of wilt which, fortunately, is not yet known to occur in Queensland.

On imperfectly drained soils, pineapple wilt may develop without the agency of any parasitic organism, due to asphyxiation or drowning of the roots. This form of wilt, which is most likely to occur in wet seasons, is usually confined to small patches located in hollows or at the foot of slopes. However, owing to the sub-normal vitality of pineapples grown on poorly drained or compact soils, they are especially susceptible to the parasitic types of wilt, even in seasons of average rainfall.

Of the types of pineapple wilt known to occur in Queensland at the present time, by far the most important is that resulting from attacks of root-destroying fungi. Although nematodes and white grubs may cause acute wilt in certain types of soil under favourable conditions, the area affected is usually limited in extent, and does not enlarge very rapidly.

Nematode wilt in pineapples usually occurs on land which has previously carried a nematode-susceptible crop, such as tomatoes, or in plantations where it is the practice to grow this and similar small crops between the rows of pineapples. Wilt resulting from white grub injury is infrequently met with, and has been observed to occur only on red volcanic soils. In any case, the aggregate losses from nematode and white grub wilts are small in comparison with those caused by fungus root rots. To distinguish the lastnamed type of wilt from the others mentioned it has been named the wilt disease. This wilt disease is, unfortunately, all too prevalent in Queensland at the present time, and during the past few years it has caused extensive losses in nearly every district.

DESCRIPTION OF WILT DISEASE.

Wilt disease develops chiefly throughout the spring and early summer months, and is most prevalent during years of excessive rainfall. Plants one to two years old are most subject to attack, which invariably results in cessation of growth, both of suckers and parent plant.

PLATE 1.

Pineapple wilt disease in a young plantation at Woombye. Note the contrast between the collapsed foliage of the diseased plants in the foreground and the erect growth of the healthy plants at the rear.

In the initial stages of the disease the leaves of affected plants lose their normal dark-green colour and assume a drab olivaceous hue. At first limp and flabby, they quickly droop and fall to the ground. This collapse of the foliage is the most striking symptom of wilt disease (Plate 1). After the plant has collapsed the leaves wither, commencing at the tips, but the final stages of the disease are slow, and complete shrivelling of the foliage may be delayed for months or even years.

When a plant becomes affected with wilt disease while its fruit is still immature, the subsequent development of the fruit is arrested, and it colours prematurely. This premature colouring of immature fruit on

PLATE 2.
Two-year-old pineapple plant affected with wilt disease. Note the erect fruit stalk and the absence of sucker growths.

wilt-affected plants is preceded by a pronounced withering of the fruit stalk for several inches immediately below the base of the fruit. Despite the drying-out of the fruit stalk, however, its rigidity is usually such as to maintain the fruit in an upright position (Plate 2). Detachment of a fruit from a withered fruit stalk is a matter of comparative difficulty, a twisting movement being required to dislodge it. Prematurely coloured fruits from wilt-affected plants are spongy in texture and sub-acid to the

palate; consequently, they have no commercial value even when of marketable size, which is rarely the case.

Rotting of the roots is invariably associated with the foliage symptoms of wilt; in fact, decay of the roots may be well advanced before any foliage symptoms become apparent. Affected plants are usually so lacking in roots that they may be pulled from the ground with little effort.

The root-rotting fungi which cause wilt disease in pineapples are active chiefly during the winter and early spring months. The relatively low temperatures prevailing at this time of the year considerably reduce the rate of transpiration from leaves and fruit, and plants denuded of soil roots are able to maintain the rigidity of their foliage by absorption, through aerial roots, of the dew or rain water which collects in their leaf axils. The trough-like structure of turgid pineapple leaves makes them peculiarly adapted for collecting water in this way. However, with the advent of warmer seasonal conditions and the consequent acceleration of the transpiration rate, the water absorbed through the axillary or aerial roots is insufficient to meet the needs of the plant, and, in the absence of a subterranean root system, growth ceases, and a sudden collapse or "wilting" of the foliage takes place. This collapse of the leaves, which is the most striking symptom of wilt disease, is irreversible, as the aerial roots are unable to obtain sufficient nourishment for them to reach the soil and thus supply the water necessary to restore the foliage to a turgid condition. However, as some growers have observed, if wilt-affected plants are uprooted, their basal leaves stripped off, and the butt trimmed back to the embryo roots higher up the stem, they may be induced to make fresh growth on replanting. This practice is inadvisable, owing to the danger of further spreading the disease.

INCIDENCE AND DISTRIBUTION OF WILT DISEASE.

Outbreaks of wilt disease in pineapples are usually spasmodic in their occurrence, but when an outbreak does occur it may spread over a wide area with great rapidity. Until a few years ago only the soils of the older districts were infected with the fungous root parasites which cause wilt diseases, but the movement of planting material originating from wilt-affected plantations has greatly aided the dissemination of these organisms to the soils of the newer pineapple districts. At the present time the disease is known to occur in every pineapple producing district in Southern Queensland. New land, when first brought under cultivation, is usually free from pineapple wilt fungi, but it quickly becomes infected through soil carried on boots and implements, and through the planting of suckers, slips, or tops, contaminated with soil from diseased fields.

When a soil favourable to the development of pineapple wilt first becomes infected with root-rotting fungi, definite steps in the progress of the disease may be seen. On new land wilt first appears in roughly circular spots a few feet to several yards in diameter. Wilting is most advanced in the centres of these spots, while around their boundaries plants may be found showing only the very first symptoms of the disease. The plants just outside the wilt-affected spots appear healthy in every respect, although their roots are often already infected with fungi. The rate at which enlargement of the diseased areas takes place depends on a variety of conditions. The root-destroying fungi which

cause wilt disease in pineapples normally lead a saprophytic or scavenging existence in the soil, their capacity to act as parasites depending on the occurrence of certain conditions unfavourable to the pineapple plant itself. Any condition or circumstance which adversely affects the growth of the pineapple plant impairs its vitality, and thereby increases its susceptibility to attack from root-rotting organisms. Thus the vitality of the pineapple plant is a measure of its resistance to wilt disease.

SOIL CONDITIONS CONTRIBUTING TO THE OCCURRENCE OF WILT DISEASE.

The various factors which adversely affect the growth of pineapples and thus determine the development of wilt disease are not yet fully understood, but it is clear that the most important of these factors are soil and weather conditions. These factors are themselves inter-related. Because of its epiphytic or air-dwelling relationships and its limited root range, the pineapple plant is particularly sensitive to soil conditions, and the occurrence of wilt disease is almost always indicative of some deficiency in or unsuitability of the soil.

Soil Moisture.

One of the most important factors involved in producing soil conditions favourable for the development of wilt disease in pineapples in Queensland is the incidence and amount of rainfall. The heaviest losses from the disease occur during excessively wet seasons, as the subsoil formation of much of the coastal pineapple land has a relatively low permeability to water, due to accumulation therein of the leachings from the upper layers. Following periods of heavy rainfall the soil of such land may remain in a sodden, semi-waterlogged state a few inches below the surface for weeks or even months, thus providing conditions favourable for the development of wilt disease, as the pineapple plant is notoriously intolerant of any interference with free root transpiration.

Erosion or Wash.

Heavy downpours are not only harmful because of the excessively wet soil conditions which they induce, but also because of the incalculable damage which they cause through erosion or wash, especially in hilly country. Loose cultivated soil is much more readily dislodged by flood waters than that which is untilled or compacted and, consequently, erosion is often particularly acute in young fields during the wet months immediately following planting. Surface erosion also results in the loss of large quantities of organic matter, as the bulk of this soil constituent is contained in the surface layers.

In addition to soil impoverishment resulting from loss of plant foods, erosion also has a direct and immediate weakening effect on pineapple plants, due to the reduced root activity consequent on the removal of soil from around the root hairs concentrated close to the surface.

Organic Matter.

Pineapples cannot be grown successfully in soils lacking in organic matter. Furthermore, it has been found that the occurrence of wilt disease in pineapples is closely correlated with the amount of decaying vegetable matter in the soil. Deficiency or lack of this constituent results

in a weakened, short-lived, and wilt-susceptible type of growth, even when the mineral plant foods are supplied in abundance. Soils containing less than 3 per cent. of organic matter are generally unsuitable for pineapple culture.

The effect of organic matter on a soil is threefold—viz.: (1) physical, (2) biological, and (3) nutritional. In the early stages of its decomposition, however, the effect is predominantly a physical or mechanical one, and it is this effect which is of especial significance in pineapple soils. The stalks and fibrous materials hold the soil particles apart, thus preventing the formation of clods and hardpan, the water-holding capacity of the soil is improved, and drainage and soil aeration are facilitated. A high organic matter content provides moisture conditions favourable for pineapple root growth in the top soil layers where there is maximum aeration and drainage, and where excessively damp conditions conducive to wilt disease rarely obtain, even during abnormally wet seasons. Unfortunately, the soils of most of the pineapple districts in this State are deficient in organic matter, even when first brought under cultivation, and unless some provision is made for its replenishment this shortage becomes acute in a very short space of time. Failure to obtain profitable returns from old land when replanted with pineapples, or failure to prevent the spread of wilt disease in replanted areas, is frequently directly related to a deficiency of organic matter in the surface soil.

Soil Reaction.

Another important contributing factor to wilt development in pineapples is unsuitable soil reaction. Contrary to the views generally held by growers, pineapples thrive best in an acid soil, for the following reasons:—Firstly, because such conditions stimulate root growth; secondly, because acid soil conditions are usually associated with good drainage; and thirdly, because an acid soil solution has the capacity to supply both phosphorous and iron in concentrations adequate for the needs of this crop. Expressed in chemical terminology, the optimum soil reaction for pineapple growth, productiveness, and longevity has been found to lie between pH 4·5 and pH 5·0. The significance of soil reaction in determining the incidence of pineapple wilt disease is indicated by the fact that the disease has not yet been found to occur in Queensland on any soil of greater acidity than pH 5·1. Unfortunately, the acidity of most of the soils used for pineapple culture in this State is considerably lower than is desirable.

Liming of pineapple soils, by neutralising the slightly acid conditions which generally obtain in them, has also contributed to losses from pineapple wilt disease in Queensland. Once a fairly general practice, liming was carried out in the erroneous belief that acid soil conditions were harmful to pineapples. However, there is no record of any permanent benefit having accrued from the use of lime on pineapple soils in this State. This is possibly because the applications have generally been excessively heavy; light dressings of lime may occasionally be necessary on soils deficient in exchangeable bases, but such applications should be made with caution, and then only under technical direction.

PREVENTION OF WILT DISEASE.

The complete recovery of wilt-affected pineapple plants never occurs; in dealing with this disease prevention should be aimed at rather

than cure. The measures advocated for preventing wilt disease are largely directed at correcting the soil conditions which make its development possible. Incidentally, these preventive measures lead to more robust growth and increased yields.

Control of Soil Reaction.

Soils sufficiently acid to meet the requirements of pineapples occur only in a few localities in Southern Queensland, and then only over limited areas of country. Consequently, in most pineapple districts some increase in soil acidity is desirable.

Under field conditions the maintenance of the soil reaction at a definite point in the pH scale is not practicable, nor is it necessary. All that is required is for the soil reaction to be kept at or below the apparent "critical point" for wilt development—namely, pH 5·0—which also approximates to the optimum reaction for pineapple growth. This may be effected by the continued use of farmyard manures or other organic refuse, by repeated dressings of acidifying fertilizers such as sulphate of ammonia, or, more quickly, by a single application of *powdered* sulphur.

The rate at which sulphur should be applied to a pineapple soil in order to bring about a desired increase in acidity varies with the initial reaction of the soil, its texture, and its chemical composition. Other factors involved are the lack of uniformity in soil conditions throughout a field, and seasonal fluctuations in soil reaction. It has been found, however, that the action of the organism which oxidises sulphur to sulphuric acid in Queensland soils is arrested by a soil reaction of approximately pH 4·5, so that there is little or no danger of pineapple soils becoming too acid through the use of sulphur, even when it is applied in excessive quantities.

Throughout the coastal districts, where correction of soil reaction is most needed, an application at the rate of 600 to 700 lb. per acre should prove adequate in most cases. Once it is applied to soil, the oxidation of sulphur to sulphuric acid takes place with great rapidity, and ceases only when the supply of free sulphur is exhausted or when the concentration of acid reaches approximately pH 4·5. Any free sulphur which remains in the soil after this limiting acid concentration has been attained is not lost or destroyed, but is utilised gradually in maintaining the soil reaction at maximum acidity.

Sulphur should not be drilled into the ground or turned under by ploughing; it should be broadcast evenly over the surface just before planting, and then thoroughly scarified into the soil to a depth of 4 or 5 inches. On sloping land the rate at which sulphur is applied at the higher levels should be somewhat heavier than at the bottom of the slope. Sulphuring should be carried out during calm weather, preferably in the early morning. As previously pointed out, liming of pineapple soils—which has an opposite effect to sulphuring—is rarely advisable.

It should be clearly understood that, as far as the wilt disease is concerned, correction of the reaction of pineapple soils by the use of sulphur is purely a preventive treatment, and is likely to prove of benefit only when carried out prior to planting. Recent field experiments have shown, however, that the control of soil acidity is ineffective on land which has a low level of fertility, particularly with regard to its organic matter content.

Maintenance of Organic Matter.

This soil constituent should be conserved in every possible direction, since oxidation and consequent loss of organic matter proceeds with extreme rapidity in cultivated soils during the summer months, especially in the light sandy soils typical of the coastal districts. For this reason, summer cultivation of pineapple fields should be restricted to the shallow chipping necessary to destroy weed growth. On strong volcanic soils it is better to keep summer weed growth in check by cutting it down periodically rather than by cultivation, particularly on hillside plantations which are subject to wash. However, conservation of soil organic matter in itself is not enough. A soil well supplied with organic matter at the commencement of the cropping cycle may be seriously depleted in this ingredient after a few seasons, unless early provision is made for its replenishment. Horse, cow, or sheep manure is of inestimable value for this purpose, but its general use is precluded by the difficulty of obtaining supplies. In the Brisbane area pineapple plantations receiving annual dressings of stable refuse have thrived for more than fifty years without replanting being rendered necessary by wilt disease or soil impoverishment. Mulches consisting of dry grass, cane trash, or other plant refuse—provided it is free from weed seeds—are also of great value in pineapple plantations, not only because they enrich the soil in organic matter but also because they smother weed growth, conserve soil moisture, and stimulate surface root development.

Another and more widely applicable method of maintaining and replenishing the organic matter content of a soil is green manuring. Prior to replanting old land with pineapples it should be green manured both in winter and summer for at least two consecutive years. For winter planting, a quick-growing cereal such as barley is suitable, either when sown alone or, for preference, when mixed with a twining legume such as Golden vetch. Any nematode-resistant legume is likely to prove useful for green manuring old pineapple land during the summer months; the recently-introduced *Crotalaria goreensis* is promising particularly well for this purpose. It is deep-rooting, non-trailing, nitrogen-fixing, drought and nematode-resisting, and makes a strong, dense, branching growth both before and after cutting. This plant also promises to be valuable for cover-cropping young pineapple fields during the first summer after planting. Though not generally recognised, this is frequently the critical period in the life of a pineapple plantation, since oxidation of organic matter takes place with great rapidity in the loose, exposed soil, which is also very subject to wash during monsoonal downpours. A suitable deep-rooting leguminous cover crop planted between the rows of young pineapples at this stage of their growth not only retards oxidation of organic matter by shading the soil, but it also protects the latter from erosion, improves its drainage, and enriches it in nitrogen.

Drainage Improvement.

Measures for improving the drainage of land which is obviously subject to water-logging will seldom prove economically practicable, and such soils should be avoided for pineapples.

The drainage of soils, which are unduly retentive of moisture in wet seasons, may usually be greatly improved by the judicious placement of open-cut drains throughout the plantation, particularly along the headlands. The repeated use of a deeply-rooting cover crop, such as the

recently-introduced *Crotalaria goreensis*, will also do much towards improving the drainage of the leached coastal soils.

The permeability of soils which are retentive of water may be increased by the use of sulphur or gypsum. In addition to lowering the water-table of a soil, gypsum fixes free ammonia and, like lime, it also exerts a beneficial effect on the physical condition of a soil. Unlike lime, however, gypsum has little or no effect on soil reaction.

Prevention of Erosion.

For preventing surface or sheet erosion on steeply sloping land, contour drains should be employed in addition to the measures advocated for maintaining the organic matter content of a soil—namely, a minimum of cultivation during the summer months, and the widest possible use of mulches and cover crops, particularly those possessing fibrous or semi-woody stems.

Additional Cultural Precautions.

The source of the planting material used has much to do with the occurrence of wilt disease on new land. Whether it is intended to plant suckers or slips, care should be taken to see that these are obtained only from wilt-free stock. It is courting disaster to use planting material of unknown origin. The planting of butts is usually an unsound practice also, as these are mostly obtained from worn-out plantations in which wilt has often been prevalent.

In pineapple fields propagated from suckers, planting too deeply is occasionally a factor contributing to wilt disease outbreaks, due to the fact that root development from deeply planted sets is retarded by inadequate soil aeration and a weak, wilt-susceptible type of growth results. In several respects slips are to be preferred to suckers as planting material, one of which is that their structure precludes the possibility of excessively deep planting, thus permitting root growth to take place close to the surface.

In young plantations losses from wilt disease may sometimes be prevented by periodical rogueing or pulling out of all weakly or stunted plants, without waiting for definite wilt symptoms to develop. However, rogueing is only likely to prove effective when practised consistently from a few months after planting.

GENERAL RECOMMENDATIONS.

From the foregoing discussion it will be evident that losses from wilt disease in pineapples can be largely prevented by suitable cultivation practices and, where necessary, corrective soil treatments.

Briefly, it is recommended that land intended for pineapples should be—(1) Naturally well drained, (2) protected from erosion, (3) plentifully supplied with organic matter, and (4) suitably acid in reaction. If all these conditions are not fulfilled in the site selected for the plantation, the deficiencies should be rectified before planting is proceeded with or the land rejected in favour of a more suitable area. In addition, extreme care should be exercised in the selection of planting material. Subsequent to planting, care should also be taken to insure that the young plants receive no check in growth, and that all weakly or diseased plants are removed immediately they are observed.

Parasites of the Dog and Cat.

By F. H. S. ROBERTS, M.Sc., Entomologist, Animal Health Station, Yeerongpilly.

OF these two animals the dog is especially important in so far as its animal parasites are concerned, for some of these may, in some way or other, affect man and his live stock to a serious and sometimes fatal degree. Some of the numerous tapeworms that in the adult stage infest the dog may occur in their larval form in man, or the sheep, pig, &c. Of these the hydatid tapeworm is by far the most important, for its larval stage may cause in man a very serious and frequently fatal disease. Measles in sheep and gid in sheep are the result of infestation with the bladderworms or larvæ of two other dog tapeworms. A very common dog tapeworm, the double-pored tapeworm, which is spread by the dog flea and dog louse, has occasionally been found in the intestine of man. A skin disease of man, called creeping eruption, and prevalent in parts of America, has been shown to be due to the larvæ of a species of dog hookworm, which, in the human host, wander about under the surface of the skin. Sarcoptic mange, which is a common skin disease of dogs, may also be transmitted to man, and although the tiny mites responsible for the condition do not succeed in establishing themselves on their human host, they may live long enough to cause serious irritation and annoyance. Finally, the annoyance caused by armies of fleas, both indoors and outdoors, may usually be directly traced to the presence of the dog.

Control of the parasites of the dog becomes therefore a matter of the greatest importance. The dog is probably the most domesticated animal associated with man; it shares his house, sometimes his plate, and even his bed, and from the point of view of public health may, if its parasites are not controlled, become a serious menace. It is, therefore, the duty of every dog owner to see that his animals are regularly treated for both external and internal parasites, and what is more important, to take all possible steps to prevent them from becoming infested.

EXTERNAL PARASITES.

A variety of external parasites infest the dog and cat, the most important of which are lice, mites, ticks, and fleas.

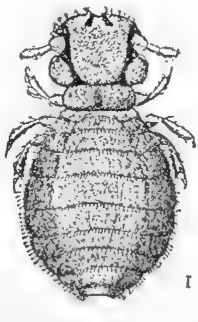


PLATE 3.—THE BITING LOUSE OF THE DOG (*Trichodectes canis*). Enlarged (after Denny).
From Bulletin No. 5, New Series, U.S. Dept. Agric.

LICE.

Two species of lice are found on the dog, a biting louse, *Trichodectes canis* (Plate 3), and a sucking louse, *Linognathus setosus* (Plate 4).

The sucking louse is a small yellowish species which, by means of its piercing and sucking mouthparts, pierces the skin of the dog and sucks up blood and serum on which it lives. This louse has a long, slender, pointed head.

The biting louse is smaller than the sucking louse, with a comparatively broad and flat head. This louse lives on the scales, scurf, &c., to be found on the skin surface.

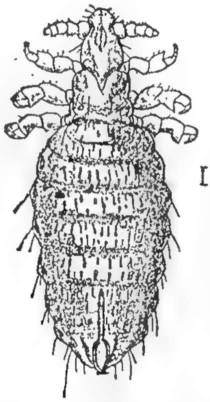


PLATE 4.—THE SUCKING LOUSE OF THE DOG (*Linognathus setosus*). From Bulletin No. 5, New Series, U.S. Dept. Agric.

Louse infestation may produce serious irritation, causing the animal to bite and scratch the infested portions of the body sometimes resulting in the formation of raw, tender areas. Puppies are especially susceptible to infestation, and cases are known in which the lice have been numerous enough to cause the death of these young animals. The biting louse is also an intermediate host of the double-pored dog tapeworm, which has on occasions been found in the small intestine of children.

Cats may be infested with a small species of biting louse, *Felicola subrostrata*, which, however, does not appear to be of much importance.

Treatment and Control.

Dogs infested with lice may be cleaned by a thorough washing in a phenolic dip.

Good results also follow the use of either derris or pyrethrum powder, which is dusted thoroughly into the coat of the animal. The powder should be allowed to remain on the dog or cat for about half an hour. It may then be combed or brushed out on to a newspaper, the paper with the dead and stupified lice thus obtained then being burnt.

In the case of cats, of course, only dusting is practicable.

The treatment should be repeated every eight to ten days till no more lice are seen.

MITES.

Mite infestation causes mange, a diseased condition of the skin which causes great irritation and makes the animal very weak and very susceptible to other parasites and other diseases. Great care should be exercised in treating a dog affected with mange for worms, as the animal may not tolerate the same dosage of the drug used as a healthy animal.

Dogs may suffer from three distinct types of mange, namely sarcoptic mange, demodectic mange, and auricular mange. Cats may also be affected by auricular mange and by a type of sarcoptic mange.

Sarcoptic Mange of the Dog.

This form of mange is caused by a minute mite, *Sarcoptes scabiei canis,* which is only one-fiftieth of an inch in size. This mite lives in galleries under the skin, the burrowing of the mites through the skin irritating the tissues and causing the formation of small red spots. In time papules appear from which serum exudes. The drying serum forms yellowish crusts which mat the hairs together. Ultimately the hair may fall out and bare scabby patches of skin are seen. The great irritation caused by the infestation results in the animal biting and scratching itself, thus forming large raw areas which may become invaded by bacteria. With the disease a distinctly mousy odour is associated. Sarcoptic mange usually commences on the head, elbows, and chest wall and on the hind legs in the region of the hocks and stifle. In advanced cases, the whole of the body may become affected, the health of the animal is greatly impaired, and unless treated the animal may die.

Occasionally, and especially in young animals, this disease takes the form of dry, bran-like scales matting the hair together. This type does not appear to cause any great irritation.

Treatment and Control.

The affected animal should be first clipped and washed thoroughly with green soap to remove all dirt, crusts, and scales. When this has been done wash the dog in a 1 per cent. solution of potassium sulphurata. Then apply—

1.	Liquor picis carbonis	10 parts
	Sublimed sulphur	10 parts
	Potassium carbonate	2 parts
	Cottonseed oil	120 parts
	or ..	
2.	A solution of lime sulphur.	

For localised mange 4 per cent. salicylic acid will give good results. "Odylen," to be applied as directed by the proprietors, is also a satisfactory treatment for mange.

When the infestation is extensive it is safest when using formula 1 to treat only one-quarter or one-third of the body at the one time. A complete cure might require several applications. In addition the animal should be muzzled to prevent him licking the treated portion of the body, and during the period of treatment the bowels should be kept open with Glauber's salts.

It should also be borne in mind that everything that will build up the health of the dog and increase its resistance to the disease should be considered. Good nourishing food, including an adequate supply of meat, fresh air, and exercise are necessary. A good tonic may be given, and as such the following will be found satisfactory:—

Citrate of iron and ammonia	5 grains
Liquor arsenici hydrochloricus ..	3 minims
Tincture nux vomica	5 minims
Chloroform water to make	2 drachms

This represents a single dose which is given twice daily after meals.

Kennels, &c., used by dogs affected with mange should be thoroughly cleaned and disinfected. It should be remembered that sarcoptic mange of the dog is transmissible to man, so great care should be exercised when handling dogs affected with this disease.

Scarpotic Mange of Cats.

This type of cat mange is caused by a minute mite known as *Notoedres cati* and is restricted usually to the head and neck. The disease causes the hair to fall out and the skin becomes wrinkled and scurfy with scab and pustule formation. The infestation causes great irritation to the cat, the animal shaking its head and continually scratching and rubbing the affected areas.

Treatment and Control.

Clip the hair from the diseased parts of the body and rub in vaseline. The vaseline is then removed by the use of a dry cloth and bran after about an hour. Then apply—

Sublimed sulphur	2 parts
Potassium carbonate	1 part
Lard	8 parts

The treatment is repeated every four to six days till the animal is cured. Attention should also be given to the sleeping quarters, &c., of the animal, which must be kept thoroughly disinfected.

Demodectic Mange of the Dog.

Also known as follicular mange, this skin disease is caused by a minute worm-like mite, *Demodex canis,* one-hundredth of an inch in size, which infests the hair follicles. The disease usually appears first around the head, elbows, and hocks, and takes the form of hairless patches often reddish in colour. These patches may simply extend and appear as scurfy areas, but if invaded by bacteria pustules of various sizes are seen. These may run together and the skin thickens and is easily damaged. The poisonous substances resulting from the infestation with the mites and bacteria become absorbed into the body and cause serious disorders. The animal becomes emaciated and weak and may die.

Treatment and Control.

There is no highly efficacious treatment known for demodectic mange, but if the treatment for sarcoptic mange is carefully followed and persisted with, the disease may be held in check and may sometimes be completely cured.

Castor oil smeared over the affected portions of the body has been recommended in some quarters. Another treatment which has been used successfully consists of the use of Lassars paste (salicylic acid 2 parts, starch 24 parts, zinc oxide 24 parts, and vaseline 50 parts).

It is now generally considered that the mite itself does very little harm and that the disease is due mainly to the invasion of the skin by pus-forming bacteria. The use of an autogenous vaccine—that is, a vaccine made from cultures of the bacteria present in the dog to be treated—has been advised and good results claimed from its use. Violet rays and X-rays have also been used successfully.

The treatment of mange is really a matter that can be dealt with competently only by a qualified veterinary practitioner, and owners of dogs affected with mange should have no hesitation in placing their animals under such care.

Auricular Mange in Dogs and Cats.

This type of mange is seen principally on the dog and its occurrence on cats is regarded as being rare. The mite causing this disease is called *Otodectes cynotis* and is slightly larger than the sarcoptic mange mite. Auricular or ear mange is confined to the ears, the irritation produced by the mites interferes with the production and disposal of wax and as a result the ear becomes filled with wax and other waste matter produced by the irritated tissues. The infested animal shakes the head and rubs and scratches the ears, causing sores and bleeding. Nervous symptoms may be shown, the animal whining and howling and is sometimes seized with fits.

Treatment and Control.

First remove all wax, &c., from the ear as carefully as possible with a pair of forceps, then swab the ear canal out with one of the following:—

1. One part of chloroform in nine parts of castor oil.
2. One part carbontetrachloride in three parts of castor oil.

Diagnosis of Mange in Dogs and Cats.

Dogs and cats may suffer from many skin diseases somewhat like mange in appearance, but in which parasitic mites are not concerned. As these particular diseases are treated by methods entirely different from those adopted for mange, it is essential that the cause of the condition be diagnosed before treatment is commenced. Mange can usually be determined only by the examination of skin scrapings, in which the mites can be seen under the microscope. These skin scrapings should be made from several parts of the affected area and the scrapings should be deep enough to cause the appearance of blood. They should then be placed in a tightly-corked bottle or sealed tin and forwarded to the laboratory.

THE DOG TICK (Rhipicephalus sanguineus).

A B

PLATE 5.—THE DOG TICK (*Rhipicephalus sanguineus* Latr.) (A) and (B).
A.—Male. B.—Female.

This is the common tick infesting the dog in Queensland and is found everywhere in the State, even in the dryest and hottest areas. The male is oval in shape and brown in colour and is to be seen crawling about among the hairs of the coat. (Plate 5 (A).) The unfed female is

greyish with dark-brown legs. (Plate 5 (B).) When engorged with blood the body colour changes to dark-red. The dog tick is an entirely distinct species from the common cattle tick, *Boophilus microplus*, which has pale fleshy legs.

Life History.

The female tick when fully fed drops from the dog, crawls away to some sheltered spot, and lays her eggs, of which up to 2,500 may be deposited. The eggs hatch in from nineteen to forty-one days, giving rise to tiny six-legged larvæ. The larvæ soon commence to look for a host, attaching themselves at the first opportunity and begin to feed. After from three to seven days the larva is engorged, drops off the dog, hides away, and after a period of rest, sheds its skin to become a four-legged nymph. In turn the nymph attaches itself to the dog, engorges in from four to ten days, drops off, moults, and the adult tick appears. Again, the adult tick waits for a host, attaches itself, and if a female becomes fertilized by the male, engorging in from six to fifty days. She then drops off, lays her eggs, shrivels up and dies.

Treatment and Control.

The fact that the dog tick is a three-host tick and that the larva and nymph can survive as long as eighty days and 150 days respectively in the absence of the dog make its control by no means an easy problem. Premises on which dogs have been for some time become so heavily infested that no sooner is the animal cleaned by hand-picking or dipping than he is shortly afterwards just as thickly infested. Control of this tick is therefore largely a matter of patient effort. Following a thorough dipping in a phenolic dip the animal should be carefully examined at least every three to four days, and all ticks removed by hand. Particular attention should be given inside the ears and between the toes. In addition, his kennel and bedding should be kept as clean as possible, the kennel being frequently sprayed with dip and the bedding boiled. Any other places frequented by the dog should be marked and sprayed.

THE SCRUB TICK (Ixodes holcyclus).

A B

PLATE 6.—THE SCRUB TICK (*Ixodes holocyclus Neum*) (A) and (B).
A.—Male. B.—Female.

This tick is normally parasitic on marsupials and is found throughout the scrubs of the eastern portion of the State. The male tick is oval in shape and yellowish in colour. (Plate 6 (A).) The unfed female has a greyish body with yellow legs. (Plate 6 (B).) When fully engorged with blood this sex assumes a very conspicuous size, and becomes dark-reddish in colour.

Among its marsupial hosts the scrub tick causes little harm, but when it attacks man and the domesticated animals a serious condition of paralysis may result. Dogs are especially susceptible to tick paralysis, and in areas where the tick is numerous it is an exceedingly difficult matter, unless adequate steps are taken, to keep a dog alive for any length of time.

An affected animal shows first of all paralysis of the hind limbs, the condition gradually including the forelimbs, head, and neck. When the paralysis reaches this stage the animal rarely recovers.

Treatment and Control.

Various remedies have from time to time been recommended for the treatment of tick paralysis; of these trypan blue is most prominent. This drug is made up and used as follows:—

A 2 per cent. solution (about nine grains to a fluid ounce of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel in which a properly-folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The solution is used. The hypodermic syringe and needle before being used should be placed in a dish containing water, then placed over the fire and boiled for ten minutes. This is now ready for use when the solution has cooled.

The injection can be made anywhere under the skin, but the best positions are either in front of the chest or behind the shoulder. A fold of skin is caught up with the fingers of the left hand and the needle manipulated with the right hand.

The dose for dogs varies according to age and size from 1 to 5 drachms.

On the other hand, Dr. I. Clunies Ross, who has made a very careful study of tick paralysis, considers that there is no drug which is of any value once paralysis has appeared, and in such case his recommendations are as follows:—

1. Remove all ticks from the sick animal. Kerosene or turpentine are useful for this purpose, a few drops being placed on the tick. It is probably best to use a pair of sharp scissors and snip out with the tick the small piece of skin to which it is attached.
2. Any fluids should be given slowly and in small quantities only. If the animal vomits, water and nourishment should be given per rectum.
3. The rectum and bladder should be frequently emptied by the use of enemas and catheters.

Very few animals make a complete recovery and for this reason preventive measures are very important. In ticky country, therefore, the dog should be carefully examined daily for ticks, paying particular attention to the head, neck, and forequarters.

FLEAS.

The flea usually found on the dog is a different species from that occurring on the cat. The dog flea is known as *Ctenocephalides canis*

(Plate 7) and the cat flea as *Ctenocephalides felis.* These two species are by no means restricted to their respective hosts; the cat flea may be found on the dog, and vice versa, and both are concerned with infestations of dwellings, stables, and other outhouses, causing considerable annoyance to man and his livestock.

Life History.

The eggs laid by the female flea on the dog or cat fall to the ground and in time hatch to give rise to a tiny maggot. The maggot feeds on the animal and vegetable matter in the dust, &c., in which it lives. When fully grown the maggot forms a sort of cocoon from the debris around it and inside this cocoon it pupates. From this pupa the adult flea eventually emerges.

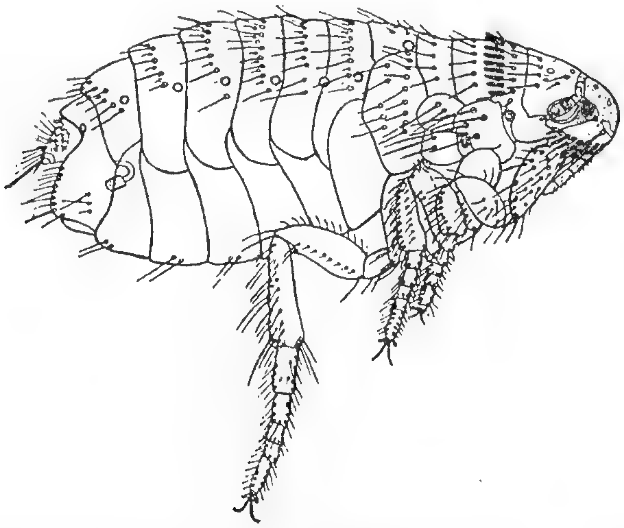


PLATE 7.—THE DOG FLEA (*Ctenocephalides canis*). Female. Lateral View. Enlarged. From Martini, 1923.

Control of Fleas on Dogs and Cats.

Dipping or the use of pyrethrum powder as directed for the control of lice will give good results. At the same time attention should be paid to the kennel and other places frequented by the animals, and these should be kept as clean and as free of litter as possible.

Control of Fleas Indoors.

Very frequently dwellings become infested with fleas and to eradicate these the following recommendations are given:—

1. If electricity is available a vacuum cleaner will get rid of a large number.
2. Remove all furniture and spray well with petrol. Petrol is highly inflammable and great care should be given its use. The skirting boards and cracks in the floor should receive special attention.
3. Hang all rugs, carpets, &c., in the sun and beat well.
4. Treat all cats and dogs as directed.
5. If the infestation is exceedingly heavy it may be best to place the matter in the hands of a reliable firm of fumigators.

Control of Fleas Outdoors.

Stables, pigsties, and the ground beneath dwellings are frequently infested by armies of fleas, and to control these the following suggestions are given:—

1. Treat all dogs and cats as directed.
2. Clean up all litter and surface dust and burn.
3. Sprinkle the soil with coarse salt and keep damp for a period of about 14-21 days. In cases where there is any danger of stock consuming large quantities of the scattered salt it is best to omit this chemical and use water only. This will destroy the larvæ, &c., in the breeding grounds.
4. Spray floors of outbuildings and other spots where adult fleas are present with petrol.

INTERNAL PARASITES.

Many different kinds of internal parasites have been recorded from the dog and cat, all of which, with the exception of one form which is related to the mites, are helminths or worms. Puppies and kittens are most seriously affected by internal parasites and a high death rate among these young animals may follow infestation.

ROUNDWORMS.

THE LARGE ROUNDWORMS OF THE DOG.

Two distinct species of large roundworms are found in the small intestine of the dog—namely, *Toxocara canis* and *Toxascaris limbata*. The latter species is an elongate whitish worm growing up to about

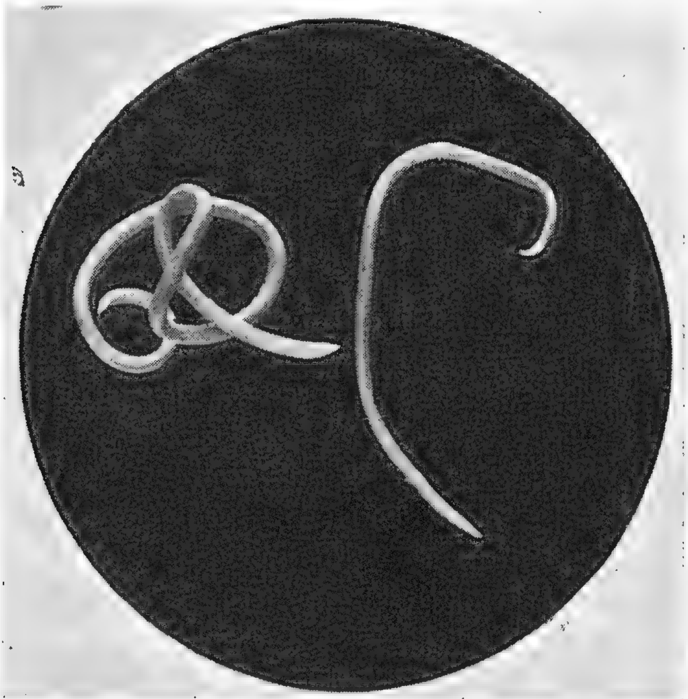


PLATE 8.—THE LARGE ROUNDWORM OF THE DOG (*Toxocara canis*). Natural size.

4 inches in length. The female is the larger of the two sexes, the male attaining only a length of about 2½ inches. *Toxocara canis* (Plate 8) is yellowish and somewhat larger and stouter, female worms measuring as much as 7 inches in length.

Life History.

The life history of both these species of roundworms is practically the same. The eggs laid by the female worms in the intestine are voided with the fæces and under favourable conditions of temperature and moisture reach the infective stage in a few days, when the egg contains a very tiny worm. When these eggs reach the mouth of the dog and are swallowed, they hatch in the small intestine and the young worms are set free. These burrow into the wall of the intestine, and, reaching the blood vessels, are carried in the blood stream to the liver. The tiny worms then travel on to the lungs, where they remain for several days. When their development in the lungs is completed, the worms, still very minute in size, crawl into the windpipe, reach the mouth, and are swallowed. In this way they reach the small intestine again, where they settle down and grow to maturity.

Effect on the Dog.

Infestation by these large roundworms is most serious among puppies and young animals, and when the worms are numerous an emaciated and unthrifty condition may be present. The worms may cause blockages in the intestine, seriously interfering with digestion, and it is not uncommon for them to wander into the stomach and cause vomiting. The larvæ, when migrating through the liver and lungs, may be responsible for serious injury to these organs with consequent ill-health to the infested animal. In general the following symptoms may be indicative of roundworm infestation:—A dull, harsh, and erect coat, emaciation, stunted growth, nervous disorders, diarrhœa, and sometimes bloated abdomen. The worms are frequently passed in numbers in the fæces or they may be vomited.

Treatment and Control.

Oil of chenopodium is the most satisfactory drug for the removal of the large roundworms. Withhold food overnight and next morning give the drug in capsules at the rate of 1 cubic centimetre for a 22 lb. dog, immediately preceded by 1 fluid oz. of castor oil. Do not allow any food till the bowels have moved.

Oil of chenopodium is a highly poisonous drug and great care should be taken to see that the castor oil moves the bowels. If no purgation has occurred within four to five hours after treatment another dose of castor oil should be given.

For puppies the dose rate is diminished to 1 to 3 minims with 1 fluid oz. of castor oil. Oil of chenopodium should not be used for dogs suffering from severe mange, distemper, gastro-enteritis, or in other cases of great weakness.

Tetrachlorethylene (Nema capsules) is much safer than oil of chenopodium though not so efficient and is given at the rate of 2 cubic centimetres for a 22 lb. dog. If the infestation is heavy it is just as well to follow the drug with Epsom or Glauber's salts.

Santonin is the safest drug for puppies and delicate breeds, and if given in the morning three hours before feeding at the rate of ¼ to 1

grain with an equal amount of calomel for six or seven days good results will be secured.

In addition to treatment preventive measures should be adopted. These consist of—

1. The prompt removal of all fæces from kennels and yards.
2. Treat all wooden floors with a boiling disinfectant solution.
3. Remove the old contaminated dirt surfaces and replace with new, clean soil.
4. Keep older animals free of worms by regular treatment.
5. Keep young animals away from contaminated yards, &c., as much as possible.

THE CAT ROUNDWORM (Toxocara mystax).

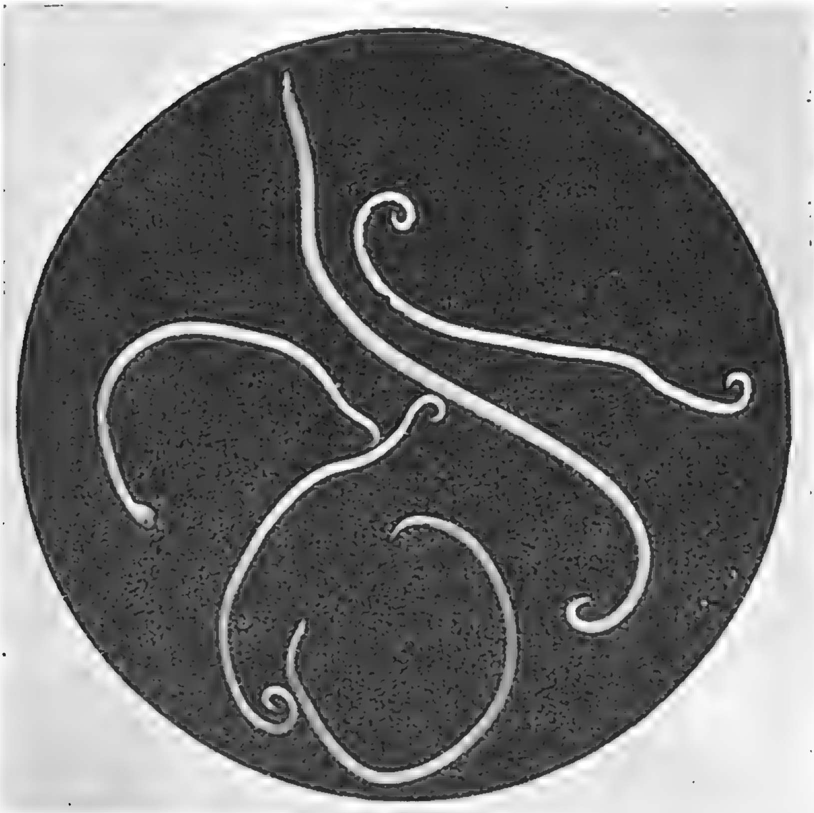


PLATE 9.—THE LARGE ROUNDWORM OF THE CAT (*Toxocara mystax*). Natural size

This is the large roundworm of the cat and is found in the small intestine. The female worm may attain a length of about 4 inches; the male is smaller, measuring only 2½ inches. Its life history and harmful effects are very similar to those detailed for the large roundworms of the dog.

Treatment.

Withhold all food overnight and next morning give tetrachlorethylene in capsules at the rate of 1 cubic centimetre for an 11 lb. cat, followed by 1 fluid oz. of castor oil five hours later.

HOOKWORMS (Ancylostoma caninum).

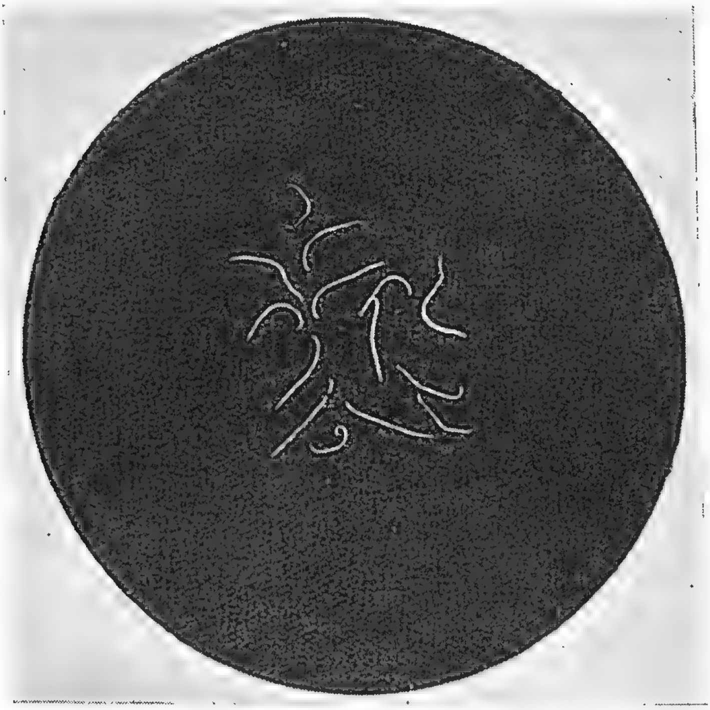


PLATE 10.—THE HOOKWORM OF THE DOG AND CAT (*Ancylostoma caninum*). Natural size.

In Queensland both dogs and cats may be infested with this species of hookworm. It is a comparatively small worm, $\frac{1}{3}$ to $\frac{1}{2}$ inch in length. The mouth is provided with six strong curved teeth which enable the parasite to grasp and feed on the wall of the intestine.

Life History.

The female worms in the small intestine lay numerous eggs which are voided in the fæces. In about 36 hours, under favourable conditions of temperature and moisture, these eggs hatch and tiny larval worms appear. The larva grows and develops in the fæces and eventually reaches a stage when it is completely enclosed in a sheath. It is now ready to infect the dog or cat and this may occur in either of two ways. The larva may be swallowed with food or water or it may bore its way into the body through the skin. In either case, the young worm reaches the blood stream and is carried to the lungs. From here it proceeds to the small intestine in much the same way as the larvæ of the large roundworms. Once in the small intestine it attaches itself to the wall of the intestine and grows to maturity.

Effect on Dogs and Cats.

The principal host of this hookworm is the dog, and so far as can be ascertained it usually occurs in the cat only in small numbers.

The worm is a notorious bloodsucker and a heavy infestation may cause a serious loss of blood. As a result the infested animal becomes anæmic, a condition which may be detected by examining the mucous membrane lining the mouth and eyes. In a healthy animal this is

pinkish to red, but if anæmia is present the membrane is bleached white. In addition the animal may show pot-belly and swellings under the jaw. Diarrhœa sometimes with blood-tinged fæces may be present. There is a distinct loss of condition, the coat is harsh and erect, the eye sunken, and the animal is dull and depressed.

Treatment and Control.

The tetrachlorethylene treatment as recommended for the large roundworms of cats and dogs respectively is also effective for hookworm in these animals.

Carbontetrachloride is a more efficient drug than tetrachlorethylene for the removal of hookworms from dogs though not so safe. The drug is given in capsule at the rate of 3 cubic centimetres for a 22 lb. dog. The treatment should include a purgative administered after the drug. Epsom salts or Glauber's salts being recommended.

All fats and oils should be excluded from the animal's diet for some days prior to treatment. The dog is starved overnight and the drug given next morning. If the bowels have not moved three hours after treatment, another dose of salts should be administered. No food should be given until proper purgation has been obtained. Tetrachlorethylene only should be used for puppies or animals in a weak condition.

Hookworm infestation can be prevented to a large extent if the preventive measures advised for the large roundworms are adopted.

THE WHIPWORM OF THE DOG (Trichuris vulpis).

This worm gets its common name from its resemblance to a whip. The species may grow up to 3 inches in length and is found in the cæcum or blind gut.

Dogs become infested when they swallow eggs which contain a tiny larval worm. These eggs hatch in the small intestine and the young worms become mature in the cæcum.

There is no simple and effective treatment yet known for whipworm infestation, but the use of santonin, as recommended for the large roundworms, is worth a trial.

The prompt removal of all dung, &c., is essential if whipworms are to be controlled.

THE HEARTWORM OF DOGS (Dirofilaria immitis).

This is a worm of conspicuous size which is found in the heart and pulmonary artery. The female may grow to about 12 inches in length, though the male rarely measures more than 5 or 6 inches. The species is very prevalent among dogs in North Queensland and is responsible for many deaths.

Life History.

The female worms in the heart or pulmonary artery deposit tiny active larvæ which escape into the blood stream. These larvæ are taken up by night-biting mosquitoes when they bite the dog and suck up blood. The larvæ undergo certain development in the mosquito, and when the insect bites a dog the larvæ are liberated into the blood stream of the animal and make their way to the heart or pulmonary artery, where they settle down and grow to the adult stage. There is a possibility that the dog flea and cat flea may also act as an intermediate host in much the same way as the mosquito.

Effect on the Dog.

Frequently no symptoms are shown till the dog is being exercised, when the animal may drop down as if dead to recover after a while. On other occasions such symptoms as abdominal dropsy, emaciation, difficult breathing, coughing, and convulsions are associated with heartworm infestation.

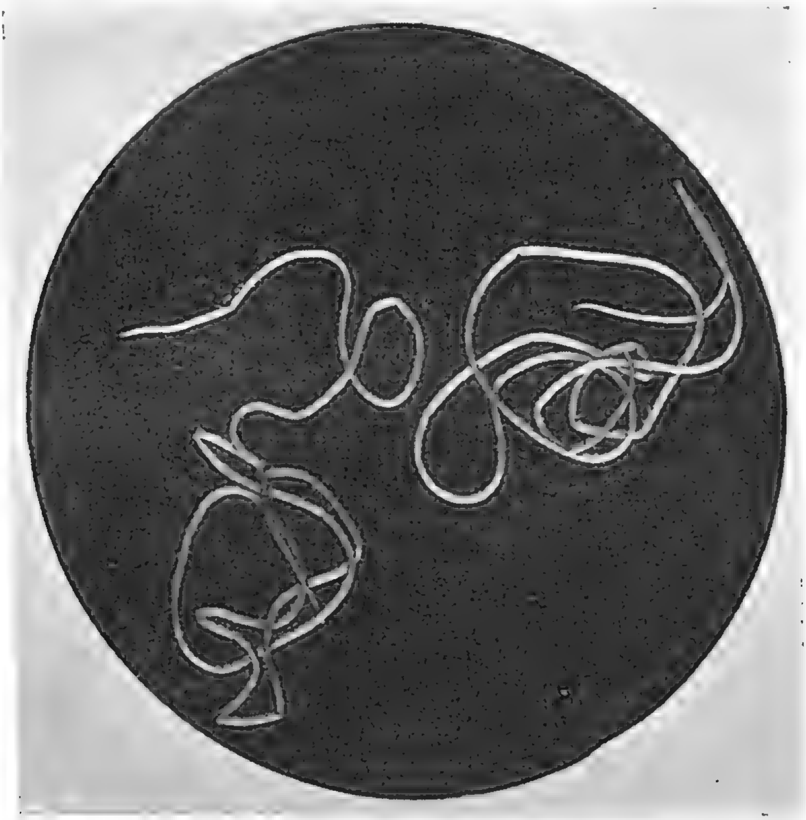


PLATE 11.—THE HEARTWORM OF DOGS (*Dirofilaria immitis*). Natural size.

Treatment and Control.

Two drugs are available for the treatment of heartworm in dogs—namely, "Fouadin" and sodium-antimony-111-bis-pyrocatechin-disulphonate of sodium. The use of these is rather complicated and is best left to the qualified veterinary practitioner.

Prevention consists of attention to the control of the particular species of mosquito and fleas responsible for carrying the larvæ and any other measures which will prevent the dog being bitten.

TAPEWORMS.

TAPEWORMS OF THE DOG.

Several different species of tapeworms are found in the small intestine of the dog. These vary tremendously in size, one species being only ½ inch long while others attain a length of 15 feet or more. They are all armed tapeworms, that is, the head is provided with hooks which

enable the worm to grasp the wall of the intestine and maintain its position in this part of the alimentary tract. The segments containing the ripe eggs become detached from the body of the worm and are voided in the faeces of the dog. These eggs must then be swallowed by another animal, known as the intermediate host, before the life cycle of the tapeworm can be completed. Man, sheep, cattle, horses, pigs, rabbits, fleas, &c., may all play the part of intermediate host for the respective species, and in these animals the life cycle stage is known as a bladder worm, which is really a larval tapeworm. This is a cyst-like body filled with fluid. The dog then becomes infested, when it eats portions of these animals which contain these bladder worms.

The most important dog tapeworm is the hydatid tapeworm *Echinococcus granulosus*, which in the adult stage is only about $\frac{1}{2}$ an inch long. Almost any mammal may act as an intermediate host for this tapeworm, including man and his livestock. In these animals, the bladder-worm stage is usually found in the liver or lungs, and in man, hydatids, or infestation with the bladder-worm, which may grow as big as a child's head, is a serious and frequently fatal disease.

The adult tapeworm is more prevalent in country dogs than in city dogs, due to the less strict supervision given the disposal of the organs containing the larval stage in the country and station slaughter-house.

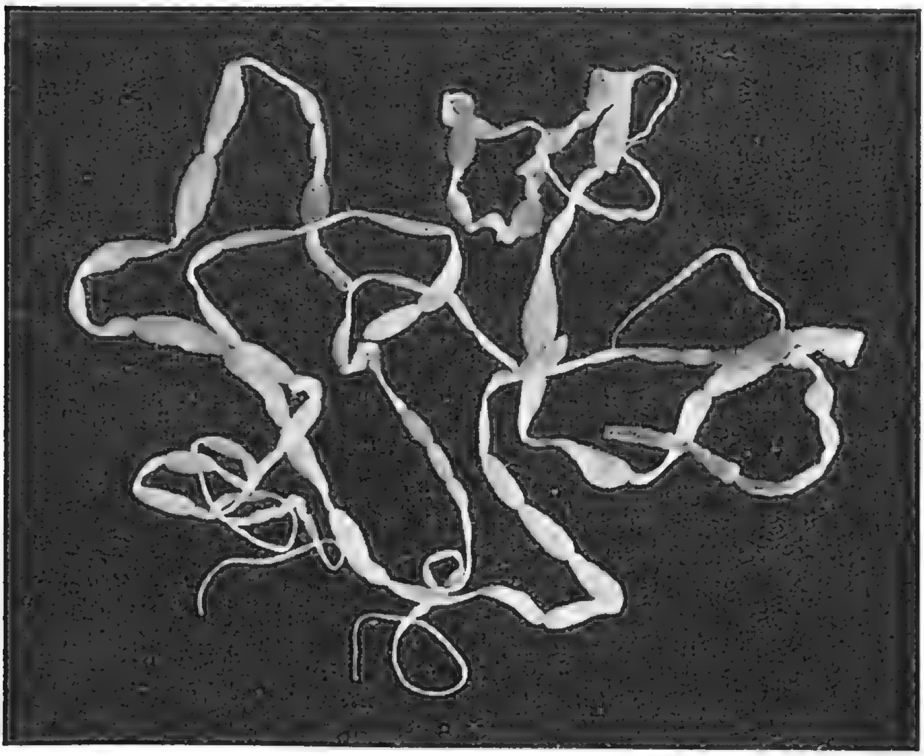


PLATE 12.—THE DOUBLE-PORED TAPEWORM OF THE DOG (*Dipylidium caninum*). Natural size.

All such offal should be thoroughly cooked before being fed to the dog, and so long as the dog receives raw liver, lungs, &c., hydatids will always be fairly prevalent in man.

The so-called "hydatids" in rabbits bears no relation to hydatids in man and is the larval stage of *Taenia pisiformis*, another dog tapeworm, the rabbit being the intermediate host of this species.

The most common tapeworm found in the dog is the double-pored tapeworm, *Dipylidium caninum* (Plate 12). This species is whitish or pinkish in colour and its segments are much longer than broad. The double-pored tapeworm may be spread by the dog flea, *Ctenocephalides canis*, or the biting louse *Trichodectes canis*. The flea becomes infected in the larval stage, the larvæ swallowing the eggs of the tapeworm present in the dust and dirt in which they live. The biting louse swallows the eggs on the contaminated skin of the dog. In the flea and louse the eggs develop into a bladder-worm and the dog becomes infested when it eats either of these insects. One of the principal measures in the control of this tapeworm is, therefore, keeping the dog free from fleas and lice.

Frequently in the body cavities of sheep, and sometimes cattle and pigs, one sees small bags of fluid suspended from the mesentery. This is the larval stage of another dog tapeworm, *Taenia hydatigena*.

Gid, which is a serious disease of sheep in Europe and America, and fortunately not present in Australia, is caused through the invasion of the brain of the sheep by the larvæ of the dog tapeworm, *Multiceps multiceps*. When the brain of an affected sheep is eaten by the dog, the larval forms develop into the adult tapeworm in the intestine of the dog.

Effect of Tapeworm Infestation on the Dog.

Heavy infestations are frequently conducive of nervous and digestive disturbances. Occasionally the worms may bunch together and form blockages in the intestine. There may be emaciation, and a very capricious appetite. Sometimes the voiding of the segments, especially those of the double-pored tapeworm, may cause itching of the anus, and to relieve this the dog may drag itself about on its haunches.

Treatment and Control.

Withhold all food overnight and next morning give arecoline hydrobromide in the following dosages:—

Small dogs	$\frac{1}{8}$ to $\frac{1}{4}$ grain
Medium dogs	$\frac{1}{4}$ to $\frac{1}{2}$ grain
Large dogs	$\frac{1}{2}$ to 1 grain

The drug is most conveniently given in a small quantity of water. Before treatment is attempted the stomach must be empty, otherwise the animal will vomit, and the efficiency of the treatment may be greatly reduced. Arecoline hydrobromide is very prompt in its action and the worms may be passed in twenty to thirty minutes after administration. No food should be given till three hours after treatment.

These dosages should be reduced for animals in a weak condition, and in such cases it would be safer to use kamala, freshly-ground areca nut, or oleoresin of male fern.

The preventive measures for the control of the dog tapeworms have already been discussed, but for the sake of emphasis are repeated:—

1. Keep the dog free of all fleas and lice.
2. Never feed raw offal to a dog; see that it is well cooked first.
3. When practicable all fæces should be removed promptly.

TAPEWORMS OF THE CAT.

Three species of tapeworms may be found in the intestine of the cat —namely, the cat tapeworm, *Taenia taeniaeformis;* the broad tapeworm, *Diphyllobothrium mansoni* (Plate 13) and occasionally the double-pored tapeworm of the dog *Dipylidium caninum.*

The cat tapeworm grows up to 2 feet in length. Its larval stage occurs in the livers of rats and mice, the cat becoming infested through eating these rodents.

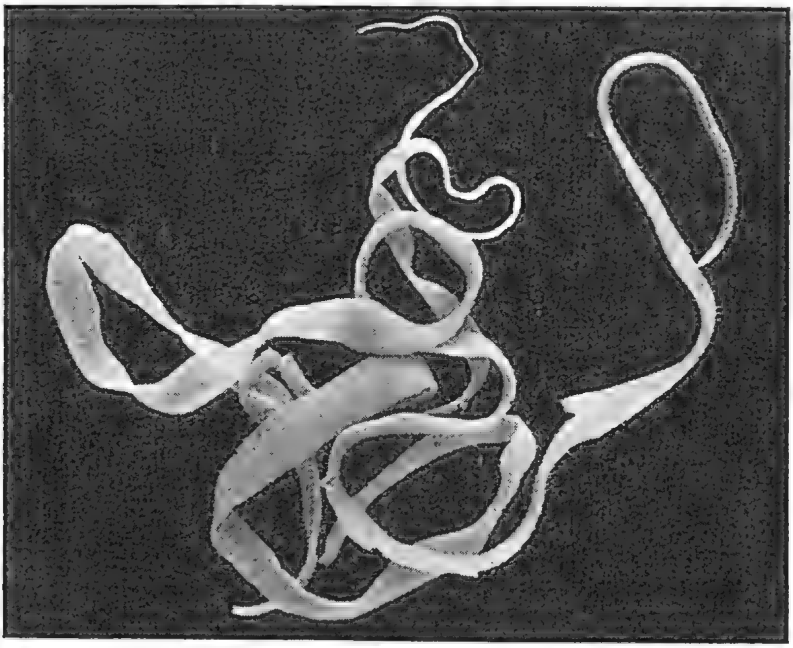


PLATE 13.—THE BROAD TAPEWORM OF THE CAT (*Diphyllobothrium mansoni*). Natural size.

The broad tapeworm (Plate 13) is a rather common species attaining a length of about 18 inches. It may be readily recognised by the series of spots in the middle of the segments. The life history of this species is unknown in Queensland, but it is thought that frogs may possibly fill the roll of intermediate host.

The effect of tapeworm infestation on the cat is similar to that given for the dog.

Treatment.

Kamala is used for removing tapeworms from cats. It is given in 10 to 15 grain doses to adult animals, either in a gelatine capsule or in syrup. The dose should be reduced for young and weak animals.

INSTRUCTIONS FOR THE FORWARDING OF PARASITES FOR IDENTIFICATION.

1. Internal Parasites—Worms.

(*a*) The specimens should be forwarded in methylated spirits. A suitable solution may be prepared by adding one volume of water to two volumes of spirits. On no account should the specimens be sent in water only, as the worms will quickly decompose without any preservative.

(*b*) When possible a number of specimens should be sent in order that both males and females be represented.

(*c*) Care should be taken in packing the container for postage. The Postal Regulations specify that sufficient packing be used to absorb any liquid that may escape through the container leaking or being broken.

(*d*) Accompanying the specimens full particulars of the following should be forwarded:—(1) The name of the animal in which the parasites were found; (2) the locality and date; (3) the name of the internal organ infested, whether the lungs, stomach, intestine, liver, &c.; (4) whether the parasite was lying free, attached, or in nodule form: and (5) the condition of the animal affected.

2. External Parasites—Flies, Lice, Fleas, Mites, and Ticks.

Flies.—(*a*) When a good series is obtainable, some specimens may be sent in spirits; the remainder in small boxes packed securely in position with cotton wool and soft paper (tissue paper). If only one specimen is forwarded it should be packed in cotton wool or tissue paper. Care should be taken in packing the specimen securely to prevent any movement, as this would tend to destroy bristles and other small structures useful for the identification of the species. Maggots should be sent alive packed in sawdust or cotton wool, the packing being slightly damped.

(*b*) Fleas, mites, and lice are best forwarded in spirits.

(*c*) Ticks are preferred alive, though, if necessary, they may be sent in spirits or formalin. The males are required and these are usually to be found in the vicinity of engorged and attached females. A good series of specimens representing both adults and young is desired. Care should be taken in detaching ticks as headless specimens are useless for identification purposes. A small drop of kerosene applied to the tick will cause it to fall off the host in a very short time. A good, steady, and patient pull will also yield good results.

(*d*) In all cases the host, locality, &c., should be noted.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Myology of the Pig

By J. A. RHEUBEN, Inspector of Stock, Brisbane.

IN the "Queensland Agricultural Journal" of February, 1933, an article appeared entitled "Are Sows Better Baconers than 'Barrows'?" The conclusion arrived at in this article leads the writer to describe a muscle existing in the abdominal and pectoral wall of the male pig which is non-existent in the female.

Since the bacon usually preferred by consumers is that in which there is a generous admixture of lean with fat, the presence of an extra muscle in flitches from the male must in consequence give bacon from this sex preference while such a demand exists.

The accompanying plates, showing in (14) the sow opened along the median line and free from any suggestion of muscle, and in (15) a barrow opened similarly showing distinctly between x x the extra existing muscle, proves conclusively the superiority of barrows as baconers.

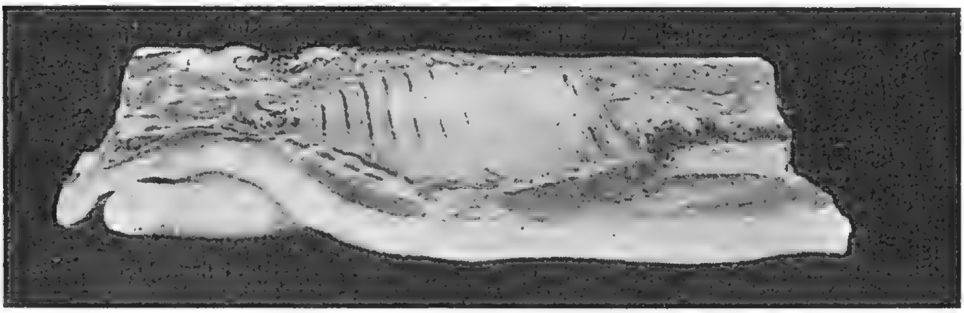


PLATE 14.

In 1933 the Royal National Association, in an effort to make comparison between the products of foreign exporters of bacon and that of our own State, imported flitches from Ireland, Sweden, Poland, Denmark, and Holland.

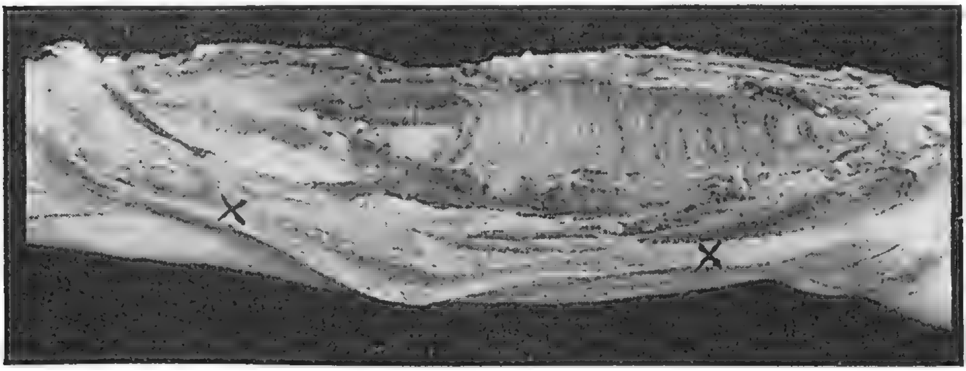


PLATE 15.

Photographs of these flitches appeared in the "Queensland Agricultural Journal," and on examination proved, without exception, to be from females. The photograph of the Queensland flitch, appearing in conjunction with the others, and selected by the writer, is of a barrow.

It would then appear that either the presence of this muscle has escaped the notice of various responsible persons in other parts of the world, or is quite unknown to them. This would, of course, mean that in competition on a market supplied by the bacon of barrows they would consistently take second place.

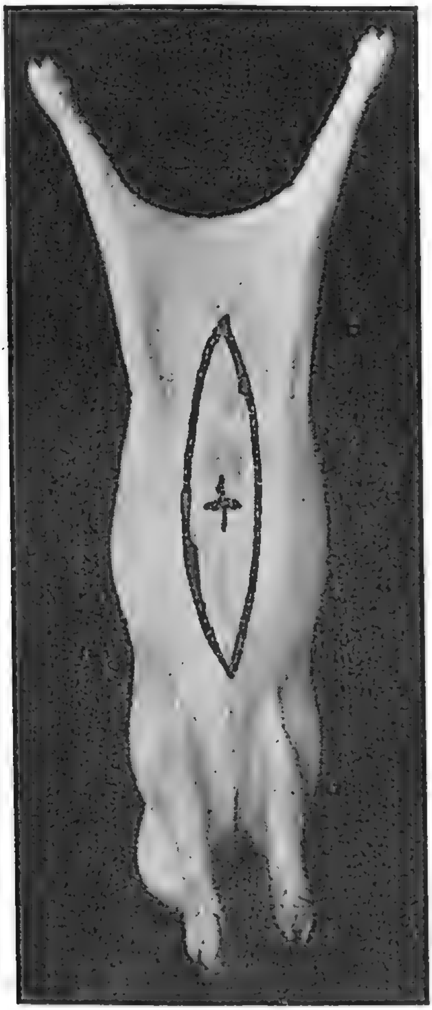


PLATE 16.

Location.—The muscle is situated along the inferior wall of the abdomen, having its anterior insertion at or about the fifth rib, reaching its maximum width of about 8 inches at the umbilicus, and having its posterior insertion at a point in line with the thin flank.

Plate 14 is of a flitch from a sow, and shows no subcutaneous muscle, such as is easily distinguishable in Plate 15 and which is marked x x. This latter photo. shows clearly the extent and location of the muscle, while in Plate 16 the pencil lines show still further its position. In Plate 16 the cross on the median line shows the position of the umbilicus.

After conversation with several veterinarians, and after a careful perusal of several text-books on anatomy, the writer has come to the conclusion that this extra subcutaneous muscle is either unknown or has not been described.

From the carcase point of view, the presence of this muscle is important. Hitherto the usual means of identification were the castration marks and the groove left on removal of the penis; these were removed in dressing, and such identification became difficult. The presence of this muscle, however, enables one to identify the carcase by the flitch.

The writer would be pleased if persons interested would communicate with the Chief Inspector of Stock and inform him if, in their experience, the muscle has been described, and the name of the particular publication.

PLATE 17.—REMOVING SILT FROM DAM, CAMERON DOWNS, HUGHENDEN DISTRICT.

Apple Packing for Export and Home Markets.

By JAS. A. GREGORY, Instructor in Fruit Packing.

PART I.

Export.

THE products of the apple industry of Australia have now become firmly established on the world's markets and meet with the keenest competition with the produce of other lands. It is necessary for all orchardists to adopt the latest methods if we are to keep up with the keen competition offered. To do this we must study all phases of harvesting and packing and use all our skill in producing a finished article that will hold its own in respect to maturity, quality, pack, and attractiveness.

Harvesting.

All apples are not suitable for exporting, and only lead to trouble and loss when sent away. It takes the whole year to grow a case of apples. Why spoil the whole of the labour by carelessness during the last operation? Variety, of course, plays a large part in successful export, early soft varieties, such as Carrington, Gravenstein, and William's Favourite being totally unsuitable. The old rule of "quickly matured, quickly bad," appears to prevail, only the late, long-maturing varieties such as Granny Smith, Stewart's Seedling, and Dunn's giving the best results. Jonathan, Delicious, and some of the other midseason varieties still present a problem in the Stanthorpe district. Codling Moth, Fruit Fly, and Bitter Pit are the main causes of trouble which can be to a great extent eliminated before packing. Growers, by studying the various trees in their orchards, can assist to a great extent in this disease elimination. It is unwise to pack for export from trees which show a high percentage of Codling Moth infestation unless the fruit is immediately cold-stored. It is quite possible for eggs laid on the fruit to develop after packing and cause damage to the consignment. White Oil as an ovicidal spray is an assistance, but has the effect of "fixing" the arsenate of lead residue firmly to the fruit, making it very hard to remove by wiping or other means. Fruit Fly is combated by growers using the ordinary means of control at hand and by exercising care in not packing under artificial light. Care in rejecting during picking is of great assistance and should be practised. "If in doubt throw it out" is a splendid motto to live up to. It is much easier to detect Fly under the natural sunlight whilst picking than whilst packing. It is the picker's job to reject, not the packer's. Bitter Pit, or Stippen, or Cork, as it is sometimes called, is a disease that gives most trouble of all in export consignments. Assisted greatly by immaturity, this disease develops during transit and in storage. Close attention to maturity is necessary. Most growers are rather prone to pick apples on the "green" side, forgetting about the development of Pit. Whilst there are many guides to maturity they are mostly internal guides and unsatisfactory, as all the apples on a tree do not mature at the same time, and whilst some fruit will test alright a high percentage will not. The best guide for the grower appears to be the change in the ground

colour of the individual fruit. Apples naturally green in colour become a brighter and lighter green in colour. Red apples change from a dull reddish ochre colour to a brighter and more crimson red, whilst red and green varieties show a combination of the two changed colours as mentioned. A pressure tester is used for testing maturity in some parts of the world, but has not altogether proved a reliable guide. The darkening of the pips is a sign of maturity, but not always an infallible test, as a dry period of weather will often induce a false maturity by changing the colour of the pips in immature apples. The texture and colour of the flesh when cut and the time it takes for the flesh to go black after cutting are also good guides. The more mature an apple is the longer the flesh takes to go black when cut. The Council for Scientific and Industrial Research, in its Bulletin No. 41 on "Bitter Pit of Apples," gives the following formula for a chemical test:—

Iodine solution for Starch Detection.—

Dissolve 1 gm. potassium iodide and 0·25 gm. iodine in 100 c.c. water, by gently heating if necessary.

Freshly-picked apples are cut across the centre and the fruit applied to the iodine solution. An iodine-starch reaction takes place, causing a discoloration of the flesh of the fruit. Immature fruit shows a greater discoloration than matured fruit, whilst over-matured apples show only a slight discoloration. As these tests are internal they, of course, are not altogether satisfactory from the grower's point of view. Growers are strongly advised not to attempt to export apples from trees carrying only a light crop or from young trees carrying their first normal crop. Mature aged trees will always give the most satisfactory results.

Over-maturity is, late in the season, a thing to be avoided. Green or semi-green apples coloured, such as Granny Smith or Jonathan, which show a change to yellow in the ground colour, should not be packed for export overseas, whilst varieties such as Dunn's and Sturmer which have gone yellow should be carefully tested for over-ripeness. Overseas buyers do not like yellow apples or badly coloured Jonathans, even if they do arrive in a saleable condition. Close attention to these points should assist in making the packing faster and better.

All fruit picked without stalks should be rejected from export consignments, as a large percentage of this fruit will possibly develop rot in the stalk cavity. Tests have proved this. This fruit can be marketed locally without waste of time with more satisfactory results. Granny Smith is a variety prone to shedding its stalk when being harvested, so extra care should be taken when picking. Scald, a cold-storage and transit disease which devlops often in Granny Smith apples, is hard to completely control. The use of oiled wrappers has been proved of great assistance, whilst sweating has also been known to have a beneficial effect.

Sweating.

It is best to get all varieties packed and on the boat as soon as possible after harvesting, with perhaps a possible exception in Granny Smith, which has given satisfactory storage results when sweating has

been practised with quantities stored until August. At the same time it must be remembered that ship storage under difficult conditions for keeping temperatures is vastly different from our established land cold stores; so it is recommended that until something more definite is available growers should endeavour to have the fruit on the ship as soon after harvesting as possible.

Cooling.

Care should be taken to let all fruit cool off after picking, before packing. This is absolutely essential if the fruit is to carry successfully for any distance.

Grading.

This operation is often confused with sizing operations. Grading is actually the sorting of fruit into grades of quality. Growers are advised to pay close attention to this operation, which should be carried out during picking operations. The absence of Black Spot (*Venturia inæqalis*) of the apple in Queensland makes it very easy to grade for quality. Colour standards in export consignments are now used. Grade designations for export have been altered, the use of the titles "Special," "Standard," and "Plain" being replaced by the designations Extra Fancy and Fancy. Colour requirements as follows have been adopted.

Colour Requirements for Various Varieties of Apples.

Solid Red—70 per cent. colour Extra Fancy (35 per cent. Fancy). Varieties: Democrat, Duke of Clarence, McIntosh Red, and King David.

Partial Red—50 per cent. colour Extra Fancy (20 per cent. Fancy). Varieties: Crofton, Geeveston Fanny, Jonathan, Worcester, Pearmain, Yates, Aromatic, Delicious, King Cole, Dougherty, Scarlet, Rokewood, Australian Beauty, Tasman's Pride, Coleman, and Jubilee.

Striped Varieties—30 per cent. Extra Fancy (10 per cent. Fancy). Varieties: Alexander, C.O.P., King Pippin, Pomme de Niege, Ribston Pippin, Statesman, Crow Egg, Nickajack, Prince Alfred, Rome Beauty, Stayman.

Uniform Colour for Variety—Cleopatra, Newtown Pippin, Sturmer, Stone Pippin, French Crab, London Pippin, Mobbs Codlin, Reinnette du Canada, Stewart's, Schroeder, Alfriston, Dunn's, Granny Smith, Wellington, White Winter Pearmain.

Varieties.

A multiplicity of varieties is not recommended for export. The following varieties from Stanthorpe give the best results:—Granny Smith, Stewart's Seedling, Alfriston. Care must be exercised when exporting Jonathan, Delicious, and similar varieties.

The tendency of the export trade is to eliminate many varieties, and good work has already been done in this direction. The following

are the present varieties permitted and the abbreviations of names of fruit which may be used on the cases:—

Method of placing wires around the case. Note bulge on fruit.

Method of placing wiring machine. Observe the amount of overlap allowed the handle of the machine. This allows free movement whilst the wire is being tightened.

List of varieties for export in 1935, together with colour requirements and abbreviations. ("Ex F." means Extra Fancy, and "F" Fancy; "E.C.," even colour):—

DESSERT, $2\frac{1}{4}$–$2\frac{3}{4}$ INCHES.

Variety.	Colour.		Abbreviation.
	Ex. F. %	F. %	
3 Aromatic	50	20	ARO.
1 Cleopatra	E.C.	E.C.	CLEO.
1 Delicious	50	20	DEL.
1 Dougherty	50	20	DHTY.
2 Geeveston Fanny	50	20	G.F.
1 Newtown Pip	E.C.	..	N.T.P.
2 Ribston Pip	30	10	R.P.
1 Rokewood	50	20	ROKE.
1 Sturmer*	..	E.C.	ST. P.
1 Statesman	30	10	STN.
3 Australian Bty.	50	20	A.B.
Ex. White Winter Pearmain	E.C.	E.C.	W.W.P.
Ex. Stayman	30	10	STAY.
Ex. Coleman	50	20	CMN.
Ex. McIntosh Red	70	35	McINTOSH RED.
Ex. Jubilee	50	20	JUB.
Ex. King Cole	50	20	K.C.

*Note.—Russet Tolerance.

DESSERT, 2–$2\frac{3}{4}$ INCHES.

1 Cox's Orange Pippin	30	10	C.O.P.

DESSERT, $2\frac{1}{8}$–$2\frac{3}{4}$ INCHES.

2 King Pippin	30	10	K.P.
1 Crofton	50	20	CROF.
1 Jonathan	50	20	JON.
3 Pomme de Niege	30	10	P.D.N.
2 Worcester Pm.	50	20	W.PM.
1 Yates	50	20	YATES
2 King David	70	35	K.D.
2 Scarlet	50	20	S.PM.

CULINARY, $2\frac{3}{8}$–3 INCHES.

1 French Crab	E.C.	E.C.	F.C.

CULINARY, $2\frac{1}{2}$–3 INCHES.

2 London Pip	E.C.	E.C.	L.P.
3 Mobb's Codlin	E.C.	E.C.	M.C.
3 Reinnette du Canada	E.C.	E.C.	R.D.C.
1 Stewarts	E.C.	E.C.	SS.
2 Schroeder	E.C.	E.C.	SCH.
Ex. Wellington	E.C.	E.C.	WTN.

CULINARY, $2\frac{1}{2}$–$3\frac{1}{4}$ INCHES.

1 Alfriston	E.C.	E.C.	ALF.
2 Prince Alfred	30	10	P.A.

DUAL PURPOSE, $2\frac{1}{4}$–3 INCHES.

	Variety.	Colour.		Abbreviation.
		Ex. F. %	F. %	
2	Alexander	30	10	ALX.
2	Crow Egg	30	10	C.E.
2	Duke of Clarence	70	35	D.C.
1	Dunns	E.C.	E.C.	DUNNS
1	Granny Smith	E.C.	E.C.	G.S.
2	Rome Beauty	30	10	R.B.
2	Nickajack	30	10	N.J.
2	Tasman's Pride	50	20	T.P.
2	Stone Pippin	E.C.	E.C.	S.P.

DUAL PURPOSE, $2\frac{1}{4}$–$3\frac{1}{4}$ INCHES.

1	Democrat	70	35	DEM.

E.C. indicates the *contents of a case must be of even colour.*

Varieties are numbered to indicate their classification as export apples.

No. 1 varieties recommended for export.

No. 2 varieties permitted to be exported, but it is not recommended that trees be converted to these varieties.

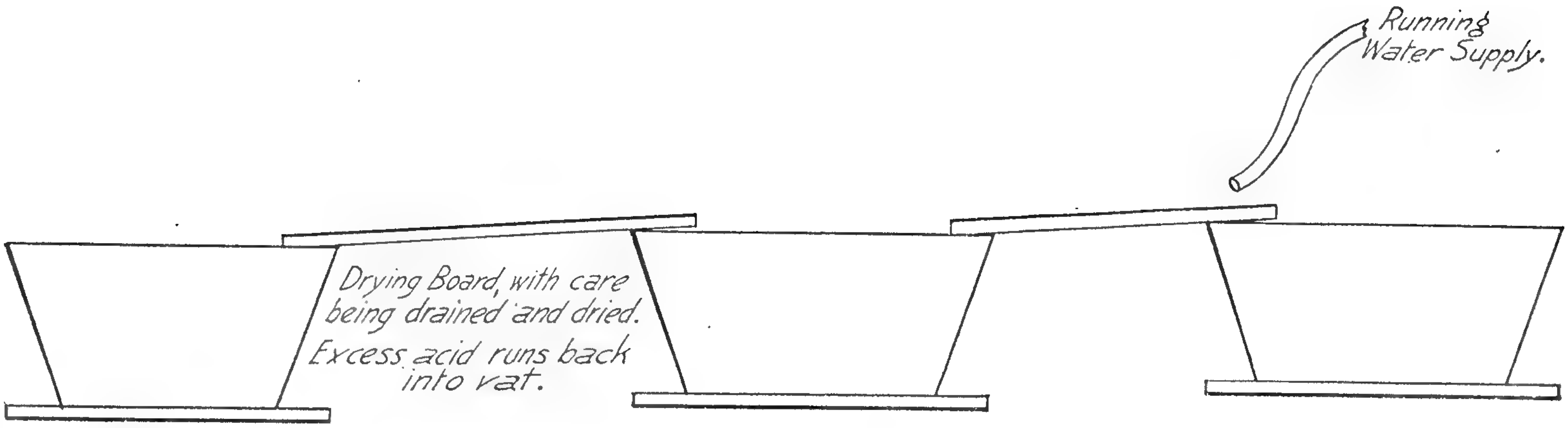
No. 3 varieties permitted to be exported for next two years, but any of these may be subsequently deleted from the export list.

Ex., Experimental.—Varieties permitted to be exported in 1935 in an experimental way, and to be the subject of reports by departmental officials and the fruit trade abroad.

Arsenate of Lead.

Growers are not permitted to export apples which carry too high a percentage of Arsenate of Lead. As mentioned before, Oil spraying in conjunction with Arsenate of Lead has the tendency to fix the lead, consequently making it harder to remove. Any quantity of Arsenic (Arsenious Trioxide As_2O_3) over 0·01 grams to the pound of fruit is not permitted. Many growers use a system of wiping to remove the residue. A rag damped in a weak solution of white oil and water is useful. Arsenate of Lead may be removed by dipping the fruit in a solution of $\frac{1}{2}$ to 1 per cent. of Hydrochloric Acid and allowing it to remain there for two minutes. The fruit is picked into picking boxes kept specially for the purpose. The system of dipping is as follows:—

Two large wooden troughs should be provided, one for the acid solution and one for rinsing water. These troughs should be large enough to hold a case of fruit without removing the fruit from the case. The acid solution is prepared and placed in the first trough (1 gallon of commercial Hydrochloric Acid (33 per cent.) mixed with 64 gallons of water will give a 1 per cent. solution of dipping fluid). The case of fruit is then placed, case and all, in this solution, which should be in sufficient quantity to cover the fruit, and gently kept moving up and down for one to two minutes. The fruit is then removed and placed on a draining rack, which permits the surplus acid to drain back into the acid bath. The fruit is then plunged into the water bath and thoroughly cleansed of acid. This bath (Plate 18) should be supplied with continuously running water. The fruit is then dried thoroughly and is ready for packing. To make the removal of the Hydrochloric Acid even more effective, a third bath of lime (1 lb. to 40 gallons) water) can be used with good effect. This has the effect of neutralising the acid. It is not necessary to rinse the fruit after using the lime bath. Fruit should be treated with this acid bath immediately after picking, so that the effects of the bath are not spoiled by the development of the natural wax



Vat 1.

Hydrochloric Acid. 1 gal. to 64 gals. water.

Vat 2.

Water continuously running for preference.

Vat. 3.

Optional for use. Lime, 1 lb. to 40 gals. water.

PLATE 18.—METHOD OF REMOVING ARSENATE OF LEAD RESIDUE.

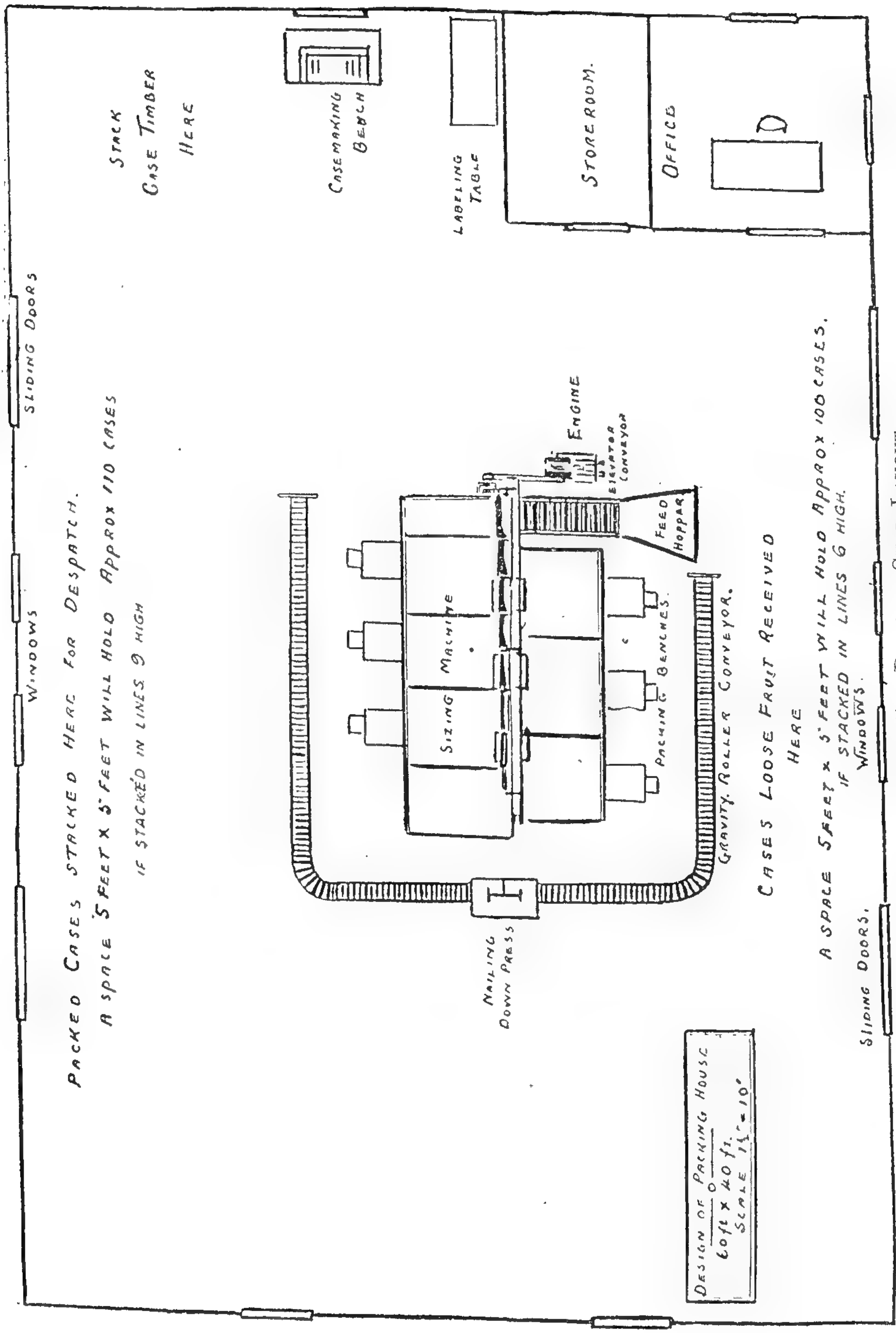


PLATE 19 (Fig. 1).—PACKING SHED LAYOUT.

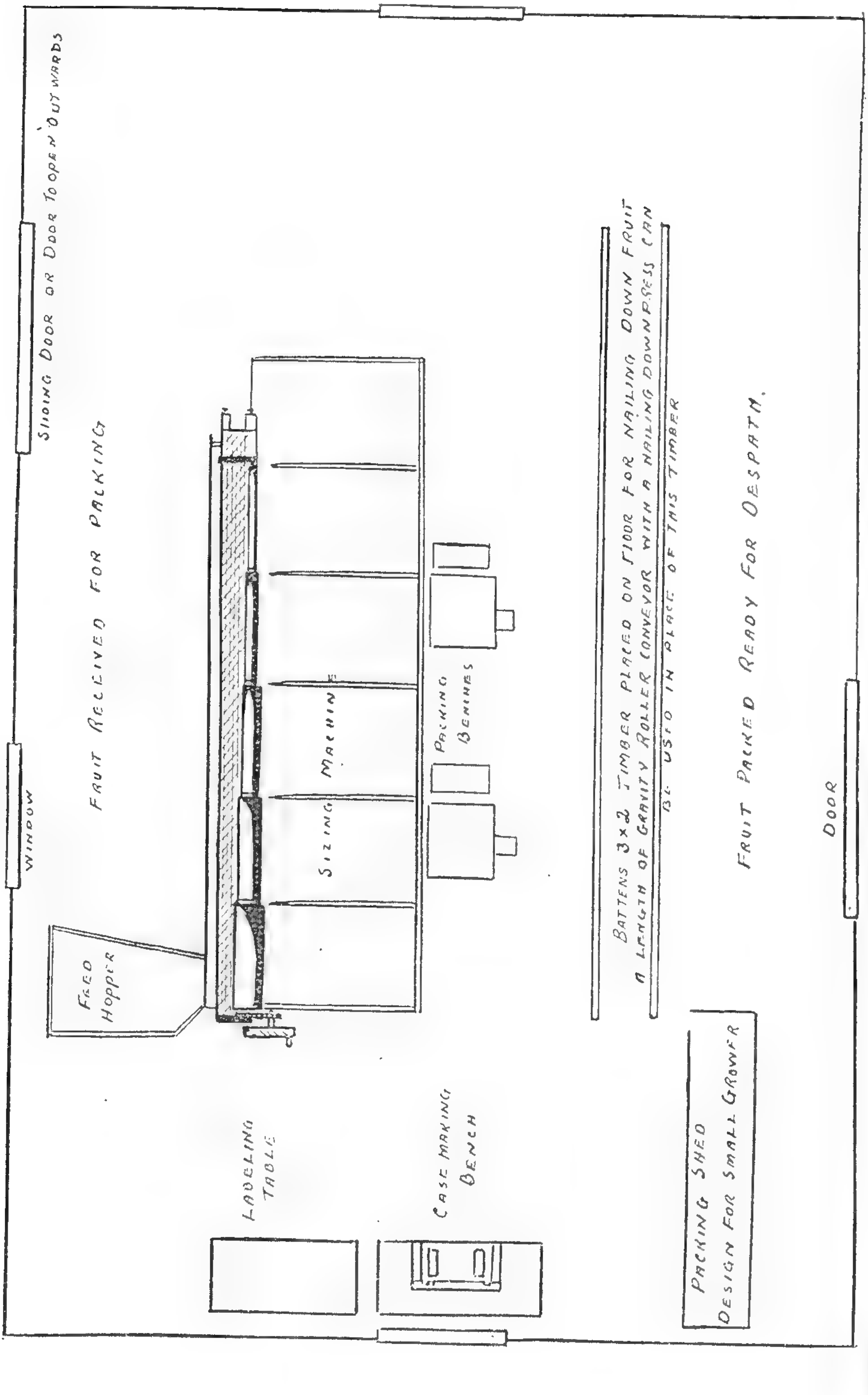
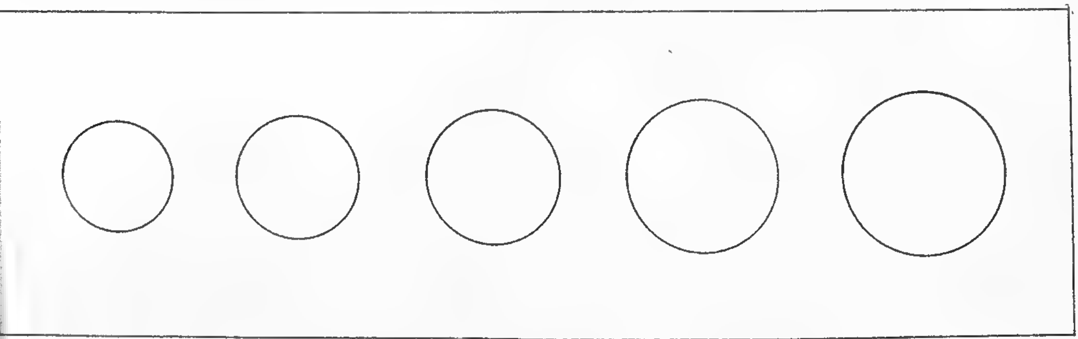


PLATE 20 (Fig. 2).—PACKING SHED LAYOUT.

on the fruit. The treatment is quicker and less costly than hand-wiping and usually adds to the attractiveness of the fruit. Care should be taken when the final lime bath is not used to thoroughly rinse the fruit, as if this is not done it is possible to seriously injure the fruit, the acid collecting in the calyx and stem cavities. Hydrochloric Acid is volatile and will eventually evaporate, but before doing so might injure the fruit. The injury appears as a bleaching of the skin, and shows a depressed area where damage occurs. Frequent changes of rinsing water, or, better still, running water, will overcome this risk. Where arsenic is present the spots turn black. A residue of acid can be readily detected by the tip of the tongue, the acid causing a sharp stinging sensation when coming in contact with the tongue. Care should be taken not to wash fruit with open calyx, as the acid is likely to cause damage to this type of fruit.

Shed Equipment.

Good packing-shed equipment helps to make the work easier and faster. In addition to the plant for washing, packing-shed plant is described. A suggested design for the layout of small packing sheds is given (Plates 19 and 20). This can be modified by growers to suit their own individual sheds. The main consideration is to keep the work moving in one direction, so that time is not wasted by walking around or dodging other work that is in progress. The following is a list of equipment to use in up-to-date Packing-houses:—Sizing Machine and Conveyor, Lidding Press, Case-making Bench, Packers' Stands with Paper Holder and Needle, Packer's Spring Boards, Nail Stripper, Case End Scraper, Stencils, Labelling outfit, including complete set of Rubber Stamps, Sizing Rings, and Roller Conveyors.



Scale. 1/4 Inch. = 1 Inch.

PLATE 21.—HAND-SIZING GAUGE.

The holes can be cut in the plywood with an expansion bit or washercutter, 1½ inch being the distance of the edge of the 3-inch hole from the edge of the board with a distance of 1¼ inch between the edges of each hole.

An up-to-date sizing plant is the first consideration. Apples are fruit that size well when sized by any of the usual commercial sizers, of which many satisfactory types are on the market. Growers will find that a sizing machine will soon repay its cost in time saved. Sizing plants can be procured from £20 upwards. A good case-making bench is another necessity. Many growers make case-making the hardest work during harvesting and marketing. Much time can be saved on case-making. Packing stands are time savers and soon repay their cost.

A lidding press is a well worth while addition to the equipment, particularly where the Standard case is being used.

A useful hand-sizing gauge (Plate 21) can be made from a piece of three-ply, 20 inches by 6 inches, with five holes cut in it with the following diameters:—2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches, $2\frac{3}{4}$ inches, and 3 inches. The packing counts can be written in alongside of each sized hole. The packer will find this gauge useful when first learning to pack. A description of how to make home-made packing-shed equipment is contained in a pamphlet issued by the Department of Agriculture and Stock, William street, Brisbane. This can be had free on application to the Under Secretary for Agriculture and Stock.

Containers.

Two different cases are used for marketing apples—the Standard case 18 inches long by $11\frac{1}{2}$ inches wide by $10\frac{1}{2}$ inches deep, and the Australian Dump case 18 inches long by $8\frac{2}{3}$ inches wide by $14\frac{1}{4}$ inches deep. Fruit for export is best packed in the Standard box, as this case

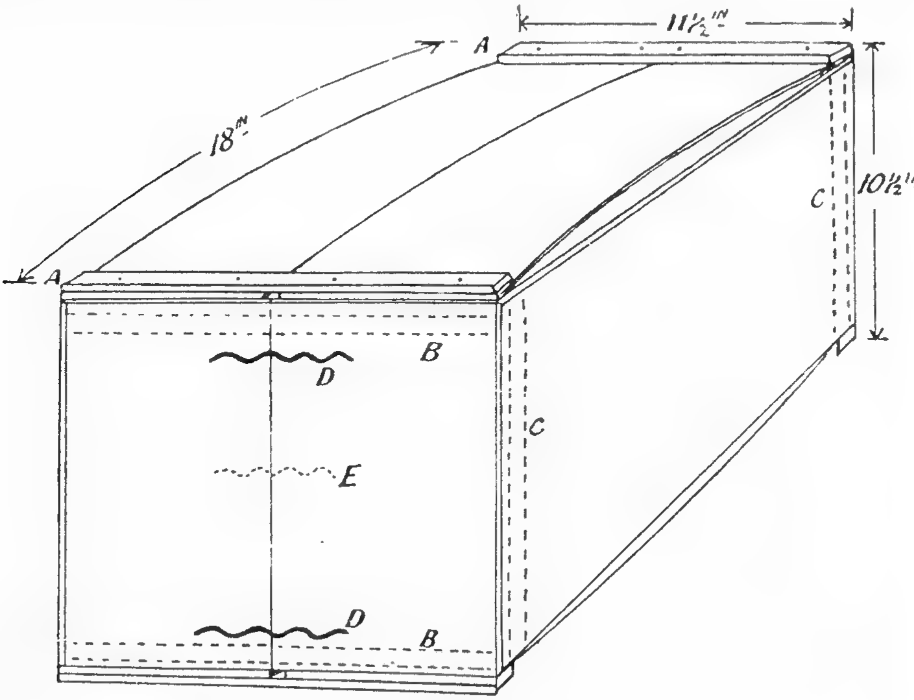


PLATE 22.—SKETCH OF CANADIAN CASE.

Correct method of making the Canadian Standard Case.

The cleats (A) are placed across the ends of the pieces of timber used for the tops and bottoms of the case, and are not used in the position indicated by the dotted lines (B and C). If growers are supplied with a case with two-piece ends, it is suggested that corrugated fasteners (D and E) be used instead of the cleats (B) indicated. Two fasteners (D) to join the two pieces should be placed on one side of the end about 1 inch from either edge, and one fastener (E) in the middle on the opposite side of the end.

is used by all the exporting countries of the world, United States, Canada, New Zealand, and South Africa. This case is also used by English and Irish apple growers to market their fruit on the British markets. The Australian Dump case is used by no other country but Australia. Some

of the States use this case for the Australian trade only, using the Standard case for all export consignments. It will be seen that on the overseas markets the Standard case is, on account of being used generally, the best commercial package for use. From the point of view of the packer the respective merits of both cases are interesting. Both cases lend themselves to doing the diagonal cheek pack to perfection. The Standard case, being wider, gives the packer more room for working, enabling him to work faster and increase his output. It has a better display value than the Dump case, having a larger face of fruit for display when used for this purpose. Properly made, it takes less nails, requiring thirty-two nails as against forty for the Dump case. Both cases, being the same length, permit of regular stacking in trucks, &c. Care should be exercised by casemakers not to drive the nails through the boards too close to the edges, $\frac{5}{8}$ to $\frac{3}{4}$ inch from the edge being necessary. (Plate 22.) This will, to a large extent, prevent the splitting of boards. Use $1\frac{1}{4}$-inch 14 gauge nails if nailing across the grain, and $1\frac{1}{2}$-inch if with the grain for sides, and $1\frac{1}{2}$-inch 14 gauge for top and bottom. Drive all nails on the scew. The following are the timber specifications for the Standard and Dump cases as required by the Commonwealth Department of Markets before the cases can be used for export purposes:—

Standard Case.

2 Ends, $11\frac{1}{2}$ inches x $10\frac{1}{2}$ inches x inch thick.

2 Sides, $19\frac{1}{4}$ inches x $10\frac{1}{2}$ inches x $\frac{5}{16}$ inch (min.).

4 Tops and 4 bottoms, $19\frac{1}{4}$ inches x $5\frac{1}{2}$ inches x $\frac{3}{16}$ inch.

2 Cleats, $11\frac{1}{2}$ inches x $\frac{3}{4}$ inch x $\frac{5}{16}$ inch (min.).

Dump Case.

2 Ends, $8\frac{3}{8}$ inches x $14\frac{1}{4}$ inches x $\frac{5}{8}$ inch thick.

4 Sides, $19\frac{1}{4}$ inches x 7 inches x $\frac{5}{16}$ inch thick.

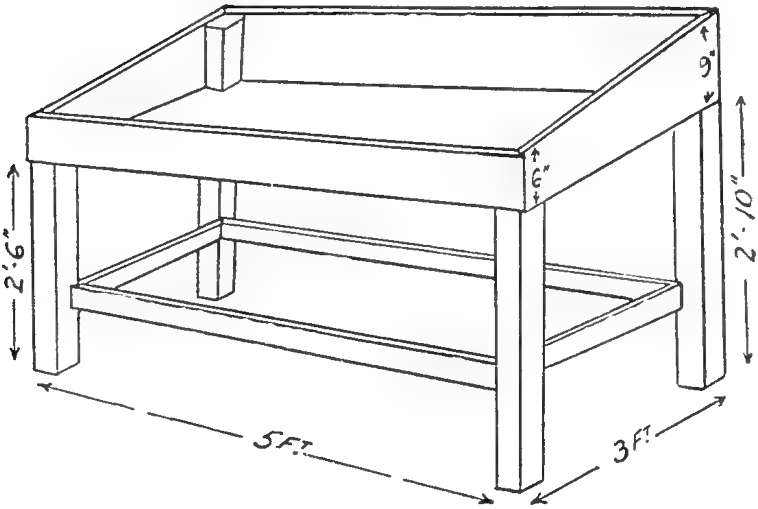
4 Tops and 4 bottoms, $19\frac{1}{4}$ inches x 4 inches x $\frac{1}{4}$ inch thick.

Single tops and bottoms are sometimes used, $19\frac{1}{4}$ inches x $8\frac{1}{2}$ inches x $\frac{1}{4}$ inch thick.

Care should be taken to use only clean, new-seasoned timber for making cases. Softwood is to be preferred to hardwood timber. Casemakers should make sure that openings, between the boards, of not more than $\frac{1}{4}$ inch occur. Wider openings than this are likely to cut the fruit on the edges of the boards. It is also necessary to see that the top and bottom edges of the side boards are not placed more than $\frac{1}{4}$ inch from the top and bottom edges of the end pieces. This will prevent fruit from being cut on the edges of the sides when nailing. Having the ends dressed on one side is an improvement to the case.

Sizing.

Sizing the fruit before packing assists greatly in making packs easy to do and easy to bring to the correct height in the case, although there are packers who find no difficulty in packing unsized fruit by using a roomy bench (see Plate 23) to hold the fruit, tipping one case only on the bench at a time. The packer then packs two different sizes at the same time, and, while packing, sorts the remaining sizes into separate heaps on the bench. Growers who are fortunate enough to have a mechanical sizer will find the operation of packing made easy, provided that care is taken to avoid the pitfalls associated with mechanical sizers. Firstly, it should be remembered that in practically all mechanical sizing machines two different counts of fruit can be packed from each bin, packing being made very easy if this rule is followed. To enable this to be done, it is well to have packing stands of the type illustrated (see



Fruit Bench to assist in Grading.

PLATE 23.

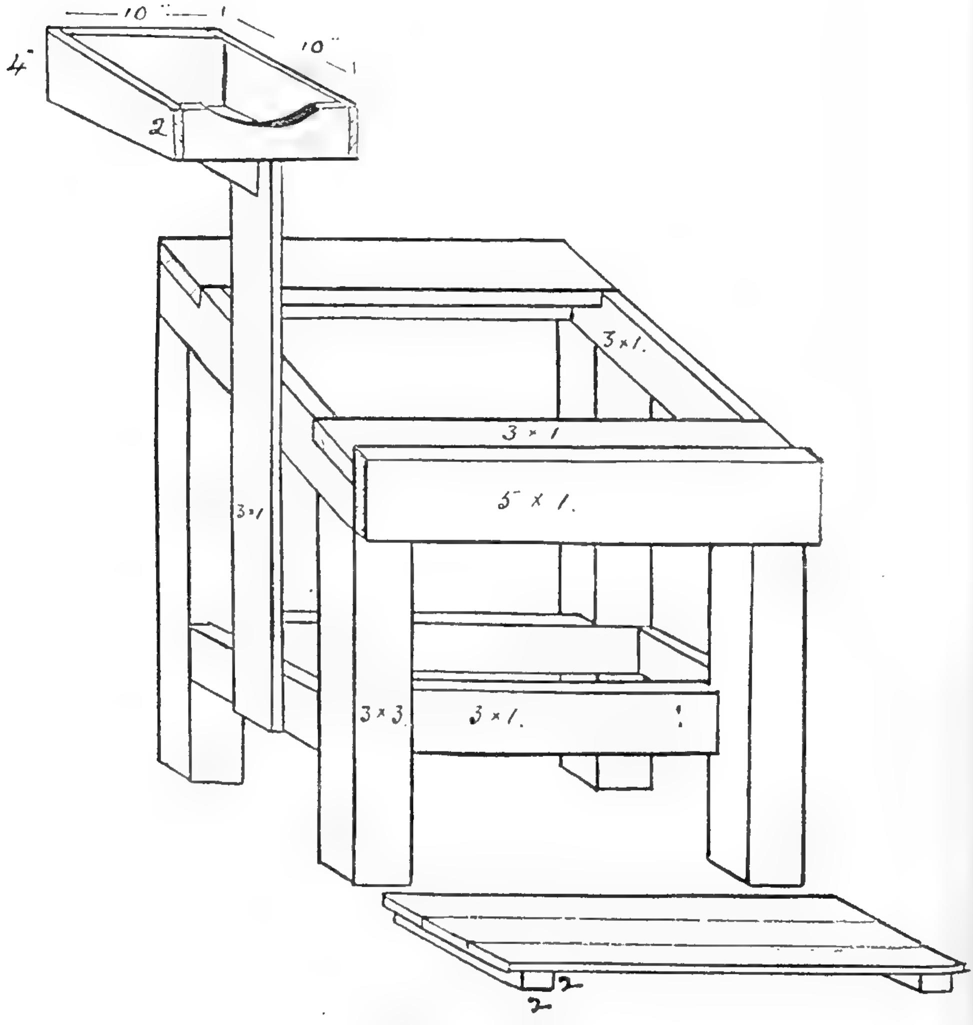


PLATE 24.—PACKING STAND.

Plate 24.) A spring-board of the type illustrated is also helpful in preventing packers from getting aching backs, tired feet, &c.

Fruit is always sized according to the measurement of its diameter, the following sizes being used:—2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches, $2\frac{3}{4}$ inches, and 3 inches. Under the Fruit and Vegetables Act no apples are allowed to be marketed in Queensland when under 2 inches in size. The size can be determined by having a sizing gauge as previously mentioned made with these diameters, the apple being placed on the ring with the stalk up. Any apple that will fall through a $2\frac{1}{4}$-inch ring but not through a 2-inch ring is classified as a 2-inch apple. Likewise, an apple that will go through a $2\frac{1}{2}$-inch ring and not through a $2\frac{1}{4}$-inch is classified as a $2\frac{1}{4}$-inch apple. This method is repeated to determine all sizes. A handy gauge can be cut from a piece of three-ply with a washer-cutter or carpenter's expansion bit. (Plate 21.) A few weeks' experience will enable the packer to become so proficient that the use of the rings will become unnecessary. Packers are advised to always pack to a count instead of making up their minds that they will pack to an exact size. When using a mechanical sizing machine, best results are obtained by keeping the rollers at a marked setting, so that the same counts can be packed out of each bin for any particular variety or shape of fruit. After any alteration of the rollers or belts to pack other fruits, the machine can be set back to its original place and the same counts for any particular variety packed from the same bins.

Packing.

The standard diagonal check system of packing is best. This pack has the following advantages:—

All layers will come to an even height in the case. (Plate 25.)

A given size of fruit will always come to the correct height in the case.

The packed fruit will always look attractive, appearing in straight lines diagonally, across, and up and down the case, whether opened on the top, bottom, or sides.

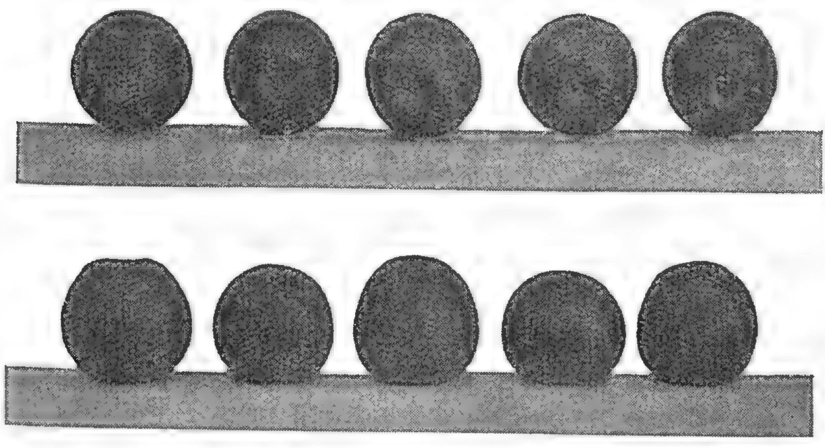


PLATE 25.

The same five apples photographed on their cheek as placed when doing the Standard Cheek pack, and on their stalks as they would be placed when doing other packs. Note the unevenness of height in both layers. This explains the main reason why the cheek pack is preferred by packers.

No two apples will rest upon the other, but in the pockets formed between the fruit of the layer beneath.

The height of the fruit in the case can be governed by making the pockets larger or smaller.

The quantity or number of fruit in the case is always the same for each pack, and can be ascertained at a glance.

It is my intention to, as far as is possible, simplify the packing. With this end in view readers will find that the various packs that can be used have been divided into two groups. One group contains (Plate 28) a list of packs that should be found by packers to be all that is necessary to pack all sizes of most types of fruit. For the Standard case this list embraces (Plate 26) Apple Packs and Counts to use, all the counts that are used by the United States of America, Canada, New Zealand, South Africa, England, and Ireland when marketing on the British and Continental markets. The second group consist of packs (Plate 29) which packers might find of use when a different type of case, such as hardwood, is used. Growers should bear in mind that counts regularly used by the established packing-houses are better understood by buyers, and should use these in preference to intermediate counts.

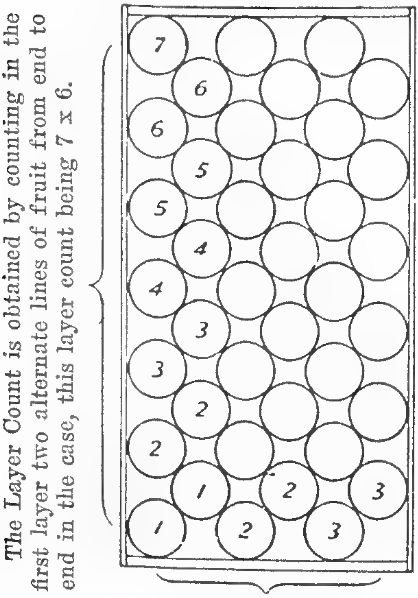
A fault often noticed in private packing-sheds is the lack of any attempt on the part of packers to provide themselves with equipment to enable them to work fast and in comfort. Proper equipment in packing-sheds soon pays for itself in increased efficiency, enabling a larger output per day to be handled. A pamphlet, "Packing Houses and their Equipment," describing how to make shed equipment, for a small cost, at home during the quiet periods of the year, can be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

By using the packing-stand illustrated (see Plate 24) the cases are slightly tilted, which helps to keep the fruit in position, thus making the packing much easier. The packer stands with the two cases to be packed into in front of him, with the fruit on one side of the cases and the wrapping paper on the other. The bench with the fruit on should be made tilted to permit the fruit to run to within easy reach of the packer.

The two cases used for apple-packing can be packed correctly by using four different packs. For the Standard box, 18 inches long by 11½ inches wide by 10½ inches deep, the 3—3, 3—2, and 2—2 packs will pack correctly all commercial sizes of fruit. When packing the Dump case the 3—2, 2—2, and 2—1 packs are used. A reference to the packing chart, used in conjunction with a description of packs, will assist the beginner in understanding the difference between the different packs.

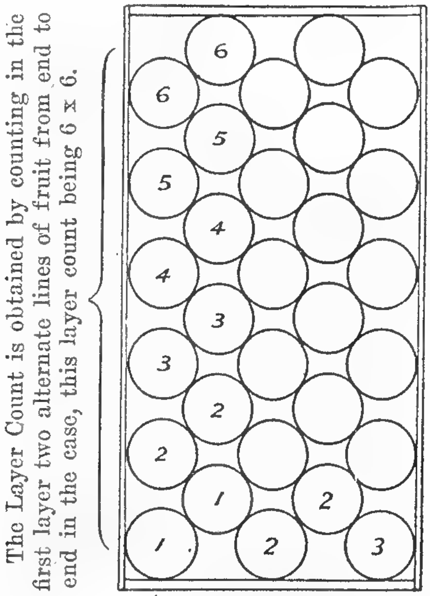
3-3 Pack. (See Plate No. 8.)

This pack is only used in the Standard box and is very easy to do if care is taken in placing the first six apples in the first layer. Three of these are placed in a layer across the end of the case with the stalks facing the end of the case farthest from the packers, the first fruit being placed in the left-hand corner and the other two being spaced equal distances apart between the corner fruit and the right-hand side



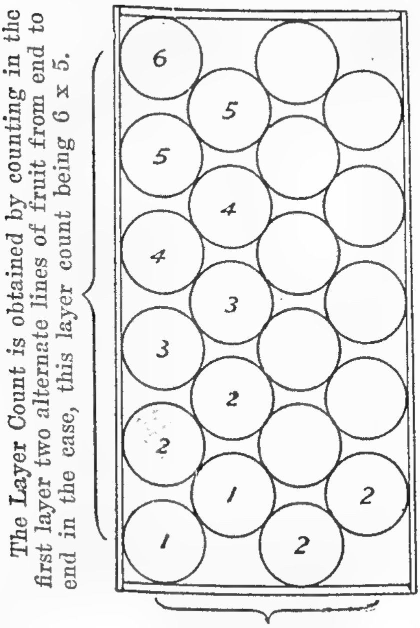
3-3 PACK.

The Pack gets its name from the way the first six fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.



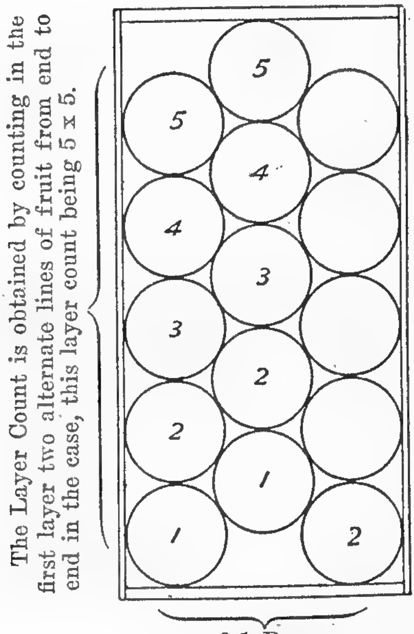
3-2 PACK.

The Pack gets its name from the way the first five fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.



2-2 PACK.

The Pack gets its name from the way the first four fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.



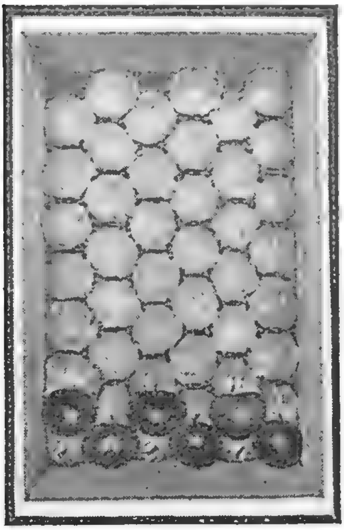
2-1 PACK.

The Pack gets its name from the way the first three fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

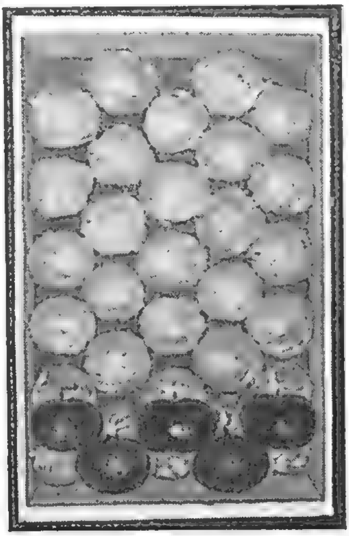
PLATE 26.—HOW TO READ AND USE THE PACKING TABLE.

of the box, leaving three spaces of the same size. In the three even spaces between the fruit we place the next three apples, forming the 3—3 from which the pack gets its name. This is repeated until the layer is finished. Care must be taken to see that fruit is placed in straight lines. The layer is then completed by placing lines of three in the spaces between each line of fruit until the last line at the end of the layer is reached. The last three apples are then placed in position but reversed so that the stalk end is facing the packer. The second layer is packed in the same manner as the first, but is placed in the pockets or spaces of the first layer, the finished case requiring six layers to complete the

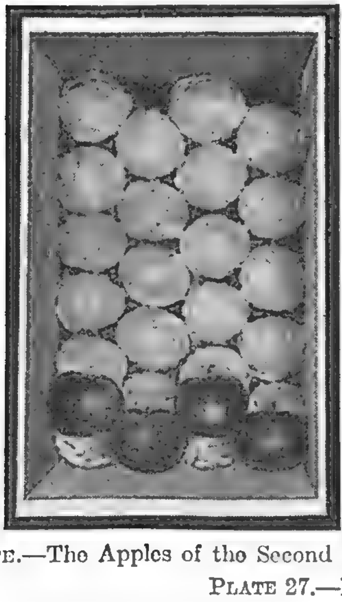
How to Start the Second Layer, 3-3 Pack.



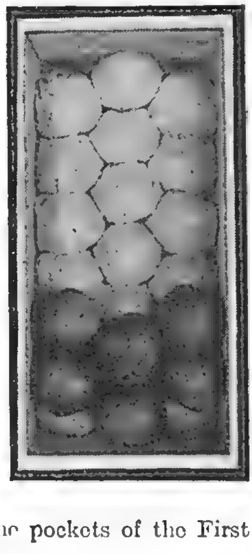
How to Start the Second Layer, 3-2 Pack.



How to Start the Second Layer, 2-2 Pack.



How to Start the Second Layer, 2-1 Pack.



NOTE.—The Apples of the Second Layer fit into the pockets of the First Layer.

PLATE 27.—PACKING ILLUSTRATED.

pack. The same rule of placing the stalk end of the fruit inwards applies in all of the packs, as it prevents the end line of fruit when they are long-stalked varieties from having the stalks squeezed into the fruit by the pressure of the end.

3-2 Pack.

In the 3—2 pack the first layer is started by placing an apple in each corner of the case and one exactly midway between them facing end to end in the case, the stalks facing from the packer. In the Dump case all the stalks face the packer. This forms a line of three apples with two spaces, or pockets, between them. The pack is continued by placing two apples in these spaces, which leaves three pockets between the two apples. We repeat the placing of three apples in these pockets, and then alternately two and three until the layer is finished, except for the last line of fruit; this is reversed with the stalks facing the packer. To start the second layer place two apples in the pockets formed by the first three apples of the first layer, then two and three alternately, the stalks facing as in the first layer, until all the pockets of the first layer are filled, again reversing the last line of fruit across the case. This process is repeated layer by layer until the case is filled. The Standard case requires five layers, the Dump case seven, to complete.

2-2 Pack.

This pack is started by placing an apple in the bottom left-hand corner of the case and midway between this apple and the right-hand side of the box a second apple, leaving two pockets between the two in which the next two apples are placed, thus forming the 2—2 from which the pack derives its name. This is then repeated, the apples being placed facing as in the 3—2 pack until the layer is finished with all but the last line of fruit. In the Dump case all stalks face the packer; in the Standard case this is reversed. The second layer is started by placing two apples in the pockets formed by the first two of the first layer, the layer being finally finished by placing apples in all the pockets of the first layer and reversing the last line of fruit as in the first layer. By repeating this process layer by layer the case is finished. The Standard case is completed with four layers, the Dump case requiring six.

2-1 Pack.

This pack is used only for the Australian Dump case. The rule of placing the stalk end of the fruit to the packer applies. The pack is started by placing an apple in each corner of the case, which leaves a space between the fruit. A third apple is placed in this space or pocket, which gives us two and one, from which the pack derives its name. The process is then repeated to complete the layer. The second layer starts with one apple placed upon the pocket between the first two of the first layer, followed by two, one, two, until the layer is finished. The case is completed by repeating further layers in the manner of the first and second layers, packing until full, the case containing five layers when completed.

APPLE PACKS AND COUNTS TO USE FOR THE CANADIAN STANDARD CASE.

18 inches long x 11½ inches wide x 10½ inches deep.

Packs to use for Conical and Round Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2 inches	3—3	7—7	6	252
2⅛ inches	3—3	7—6	6	234
2¼ inches	3—3	6—6	6	216
2⅜ inches	3—3	6—5	6	198
2½ inches	3—3	5—5	6	180
2⅝ inches	3—2	7—6	5	163
	3—2	6—6	5	150
2¾ inches	3—2	6—5	5	138
2⅞ inches	3—2	5—5	5	125
3 inches	3—2	5—4	5	113
	3—2	4—4	5	100
3¼ inches	2—2	6—6	4	96
	2—2	6—5	4	88
	2—2	5—5	4	80
	2—2	5—4	4	72
	2—2	4—4	4	64

The counts are standard on the worlds markets, being used by United States of America, Canada, New Zealand, England, and Ireland.

Packs to Use for Flat Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2 inches	3—3	8—8	6	288
2⅛ inches	3—3	8—7	6	270
	3—3	7—7	6	252
2¼ inches	3—3	7—6	6	234
	3—3	6—6	6	216
2½ inches	3—2	8—8	5	200
	3—2	8—7	5	188
2⅝ inches	3—2	7—7	5	175
	3—2	7—6	5	163
2¾ inches	3—2	6—6	5	150
	3—2	6—5	5	138
3 inches	3—2	5—5	5	125
3¼ inches	3—2	5—4	5	113
3½ inches	2—2	7—6	4	104
	2—2	6—6	4	96
	2—2	6—5	4	88
	2—2	5—5	4	80
	2—2	5—4	4	72
	2—2	4—4	4	64
	2—2	4—3	4	56
	2—2	3—3	4	48

The counts are standard on the world's markets, being used by United States of America, Canada, New Zealand, England, and Ireland.

PLATE 28.—APPLE PACKS AND COUNTS.

Alternate packs may be used when packing hardwood cases, which do not bulge easily on the top and bottom.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
$2\frac{1}{8}$ inches	3—3	9—8	5	255
	3—3	8—8	5	240
$2\frac{1}{4}$ inches	3—3	8—7	5	225
	3—3	7—7	5	210
	3—3	7—6	5	195
$2\frac{1}{2}$ inches	3—2	6—6	6	180
	3—3	6—5	5	165
	3—3	5—5	5	150
$2\frac{3}{4}$ inches	3—2	6—6	4	120
3 inches	3—2	6—5	4	110
	3—2	5—5	4	100
$3\frac{1}{4}$ inches	3—2	5—4	4	90
	3—2	4—3	5	88

These packs should not be used at any time for export overseas.

PLATE 29.—ALTERNATE PACKS.

PACKS TO USE WHEN USING THE AUSTRALIAN DUMP CASE.

18 inches x $8\frac{2}{3}$ inches wide x $14\frac{1}{4}$ inches deep.

FOR CONICAL OR ROUND APPLES.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
$2\frac{1}{4}$ inches	3—2	7—7	7	245
	3—2	7—6	7	228
	3—2	6—6	7	210
	3—2	6—5	7	193
$2\frac{1}{2}$ inches	3—2	5—5	7	175
	3—2	5—4	7	158
	2—2	7—6	6	156
	2—2	6—6	6	144
$2\frac{3}{4}$ inches	2—2	6—5	6	132
	2—2	5—5	6	120
3 inches	2—2	5—4	6	108
$3\frac{1}{4}$ inches	2—1	6—6	5	90
	2—1	6—5	5	83
	2—1	5—5	5	75
	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53

PLATE 30.—PACKS FOR AUSTRALIAN DUMP CASE.

Australian Dump Case Packs for Flat Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2¼ inches	3—2	8—8	7	280
	3—2	8—7	7	263
	3—2	7—7	7	245
	3—2	7—6	7	228
2½ inches	3—2	6—6	7	210
	3—2	6—5	7	193
	3—2	5—5	7	175
	2—2	8—7	6	180
2¾ inches	2—2	7—7	6	168
	2—2	7—6	6	156
	2—2	6—6	6	144
	2—2	6—5	6	132
3 inches	2—2	5—5	6	120
	2—2	5—4	6	108
	2—1	7—7	5	105
3¼ inches	2—1	7—6	5	98
	2—1	6—6	5	90
	2—1	6—5	5	83
	2—1	5—5	5	75
	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53
	2—1	3—3	5	45

PLATE 30—*continued.*

A close examination of the packing-tables given will be of assistance. These will be dealt with separately for both cases. To simplify the packing as much as possible the packs will be divided into two sections for each case, one table giving the open pocket packs to use, the second giving the pocket packs which can be used but are not recommended.

Packing the Australian Dump Case.

The dimensions of the Australian Dump case are—18 inches long by 8⅔ inches wide by 14¼ inches deep. The timber for this box should be cut with the sides of a minimum thickness of five-sixteenths of an inch, with the tops and bottoms a quarter of an inch thick. Unlike the Standard box, no cleats are used. The finished case should have a bulge of ½ inch to 1 inch on the top and bottom of the case when packed. Three packs are used to pack this box—the 2—1, 2—2, and 3—2.

By calculating the height the fruit will come to in the case two or three layers before the top is reached, the packer, by applying the rule "The size of the pockets governs the height of the fruit in the case," can bring the fruit either higher or lower as required. This is done by making the pockets smaller by slightly increasing the size of the fruit and placing it on a bigger angle, bringing the fruit higher in the box to correct a pack which will come too low, or, in the case of a pack that is coming high, to open the pockets by reducing slightly the size of the fruit and placing it more at right angles to the side of the box. Usually the fault of the fruit coming to the wrong height is caused by a variation in sizing the fruit in the subsequent layers after placing the first layer into

position. Cases not of the correct width are often the cause of trouble in bringing the pack to the correct height, but by following the rule governing the size of the pockets this difficulty may generally be overcome satisfactorily. It should be remembered that it is an offence against the Fruit and Vegetables Act to market fruit in under-sized cases. The Export Regulations also control the size of cases used.

THE SAME FRUIT.

Both cases opened on the side.

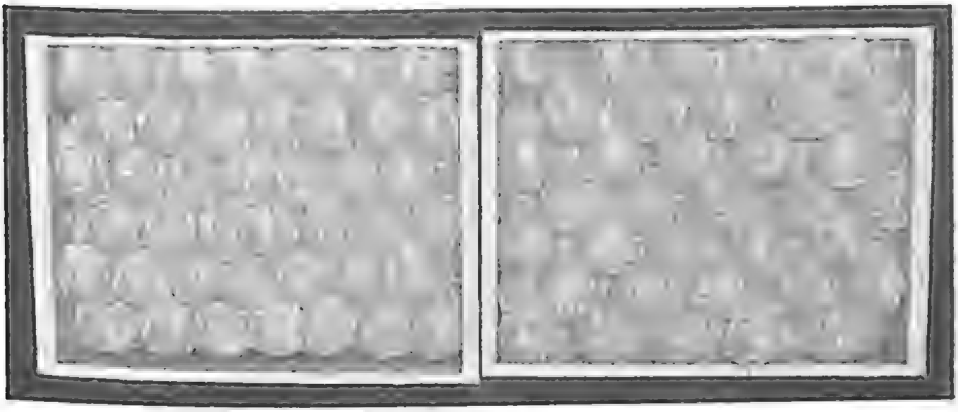


PLATE 31.—SIDE VIEW OF PACK.

Count 175, 3-2 Pack. CORRECT HEIGHT.

Count 168. 2-2 Pack. Note space between top layer and lid.

2½ inch apples, round or conical in shape, will not come to the correct height when packed 2-2 pack, 7-7 layers, count 6 layers 168, but if packed 3-2 pack, 5-5 layer count 7 layers 175, no trouble should be experienced.

THE SAME FRUIT.

Both cases opened on the side.

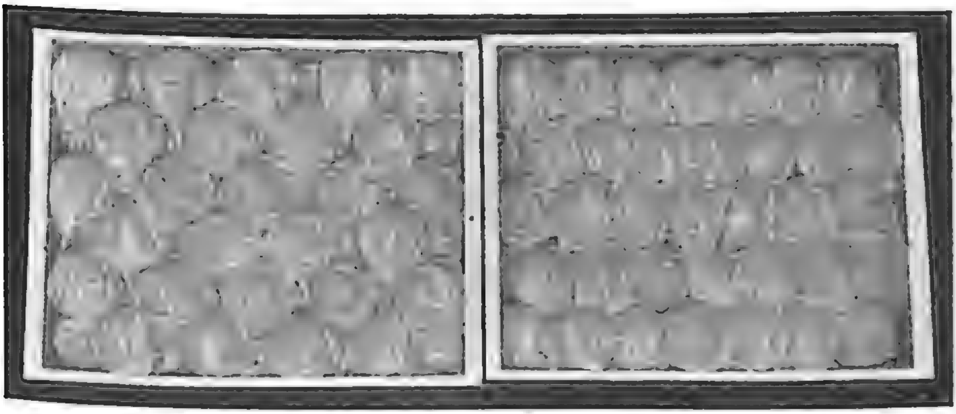


PLATE 32.—ANOTHER SIDE VIEW.

2-2 Pack, 5-4 Layer. Count 6 Layers. Correct Pack.

2-1 Pack, 7-7 Layer. Count 5 Layers, 105. Low Pack.

3 inch apples packed 105 count 2-1 with 6 layers is too low, but when packed 2-2, 5-4, 108 count comes to the correct height. Compare height of fruit with distance from lid.

Packing the Standard Case.

The Standard case is more convenient to pack than the Dump case, allowing the packer more room to work, due to its extra width. Care should be taken to see that the timber specifications are strictly adhered to, as the whole success of the case depends on its being correctly milled and made up. The 3—3, 3—2, and 2—2 packs are used to pack this box. The finished case should be packed 1½ inches above the top of the case at the centre of the layer with a natural bulge being formed causing the ends to be lower than the centre. Where the case is packed on a packing-stand that does not permit the bottom of the case to bulge slightly while being packed the height of the centre of the top cover above the top of the case should be up to 2 inches. A bulge of this size will give a complete bulge top and bottom of approximately 1 inch when nailed down.

Packing for Local Market.

The same attention to detail should be given to packing for local market. Cases are sometimes lined with clean white paper, but this is unnecessary where wrapping is practised and cardboard guards are used. If corrugated cardboard guards are not used unwrapped fruit should be packed in paper-lined cases to prevent case pressing and rubbing. Clean plain white or coloured paper should be used. Wrapping is always recommended in preference to packing fruit without wraps.

Case-marking Abbreviations for Apples.

The following case-marking abbreviations for apples have been arranged by Australian Departments of Agriculture:—

Variety.	Abbrev.	Variety.	Abbrev.
Adam's Pearman	A.P.M.	London Pippin (Five Crown)	L.P.
Alexander	ALEX.	Lord Nelson	L.N.
Alfriston	ALF.	Lord Suffield	L.SF.
Allington	ALN.	Lord Wolseley	L.W.
Aromatic	ARO.	McIntosh Red	McRED.
Ben Davis	BEN D.	Mobb's Codlin	MOB.
Bismarck	BIS.	Newtown Pippin	N.P.
Black Ben Davis	B.B.D.	Nickajack	NICK.
Buncombe	BUN.	Perfection	PFN.
Cleopatra	CLEO.	Prince Alfred	P.A.
Commerce	COM.	Ranelagh	RAN.
Cox's Orange Pippin	C.O.P.	Ribstone Pippin	RIB.
Crofton	CROF.	Reinnette de Canada	R/C.
Crow's Egg	C.E.	Rokewood	ROKE.
Delicious	DEL.	Rome Beauty	ROME.
Democrat (*see* also Tasma)	DEM.	Rymer	RYM.
Dougherty	DHTY.	Scarlet Nonpariel	S. NON.
Duke of Clarence	D.C.	Scarlet Pearmain	S.PM.
Dumelow (Wellington Pippin)	DML.	Senator	SEN.
Dunns	DUNNS.	Spitzenberg	SPTZ.
*Fameuse	FAM.	Statesman	STATE.
Fanny	FNY.	Stayman (Stayman Winesap)	STY.W.
Five Crown (*see* London Pippin)		Stewart's Seedling	S.S.
		Stone Pippin	STONE
Foster	FOS.	Strawberry Pippin (Winter Strawberry)	STR. P.
French Crab	F.C.	Sturmer Pippin	ST. P.
Granny Smith	G.S.	Tasman's Pride	TAS. P.
Gravenstein	GRAV.	Tasma (*see* also Democrat)	TASMA
Hoover	HOOV.	Thompson's Seedling	T.S.
Jonathan	JON.	Worcester Pearmain	W. PM.
King David	K.D.	Yates	YATES.
King of Pippins	K.P.		

*Known as Fanny in New South Wales.

Wrapping.

We hear of right-hand and left-hand wrappers. Either in the writer's opinion can be correct. A packer should always handle the fruit with the hand that he naturally uses. As an illustration, a man who naturally uses his right hand should handle the fruit with this hand and pick up the wrapping-paper with his left hand. Picking up the wrapping paper is only a mechanical operation and can soon be acquired using either hand. On the contrary, picking up fruit to pack is more than mechanical, as the element of instinct in picking up the correct size to pack enters into it. Good packers size correctly largely by this instinct of feel. This naturally should be more highly developed in the hand that it is natural to use, so that the greatest efficiency should be attained by natural right-handers picking up the fruit with the right hand. Packers should practice placing the fruit in the case with both hands. Common Sulphite wraps are glazed on one side. This side should be placed up in the paper-holder, so that when the fruit is wrapped the glazed or shining side is on the outside.

Method of Wrapping.

Place wraps in the paper-holder, glazed side up. A rubber finger stall may be worn on the forefinger of the left hand, as by its use single wraps are picked up easily. The wrap is picked up with the left hand, one corner pointing towards the packer, the centre of the wrap in the centre of the palm. At the same time an apple is picked up with the right hand.

The apple is thrown into the wrap with some force in order to jerk up the edges of the wrap around the apple. The apple strikes on its cheek in the centre of the wrap, with its stem end pointing midway between the thumb and index finger. As the apple is caught the thumb and fingers of the left hand are closed about the apple, forming a cup, and remain in this cupped position throughout the wrapping process. As the apple is thrown the right hand advances towards the blossom end of the fruit with fingers together and thumb extended at nearly right angles to fingers. The index finger is up and the little finger is down. The lower corners of the wrap are brushed closely over the apple with the thumb and forefinger of the right hand, bringing all corners of the wrap tightly together at the top, except the corner between the thumb and forefinger of the left hand.

Now, holding the apple tightly within the wrap with the thumb and forefinger of the right hand, both wrists are twisted towards the right. The apple turns within the cup formed by the left hand, the fingers of the left hand moving between the apple and the fingers of the right. The hands are turned completely over, until the back of the left is upward and the back of the right is downward.

The apple is now held in the cup formed by the left hand, with its stem pointing between the second and third fingers, and is placed in the box with the tails of the paper downward, while the right hand reaches for another apple. The positions illustrated are described in detail, but it must be understood that, when wrapping, these positions blend into each other so rapidly that an expert packer appears to be picking up apples with his right hand and paper with his left, and placing the wrapped apple in the box. It is readily seen that

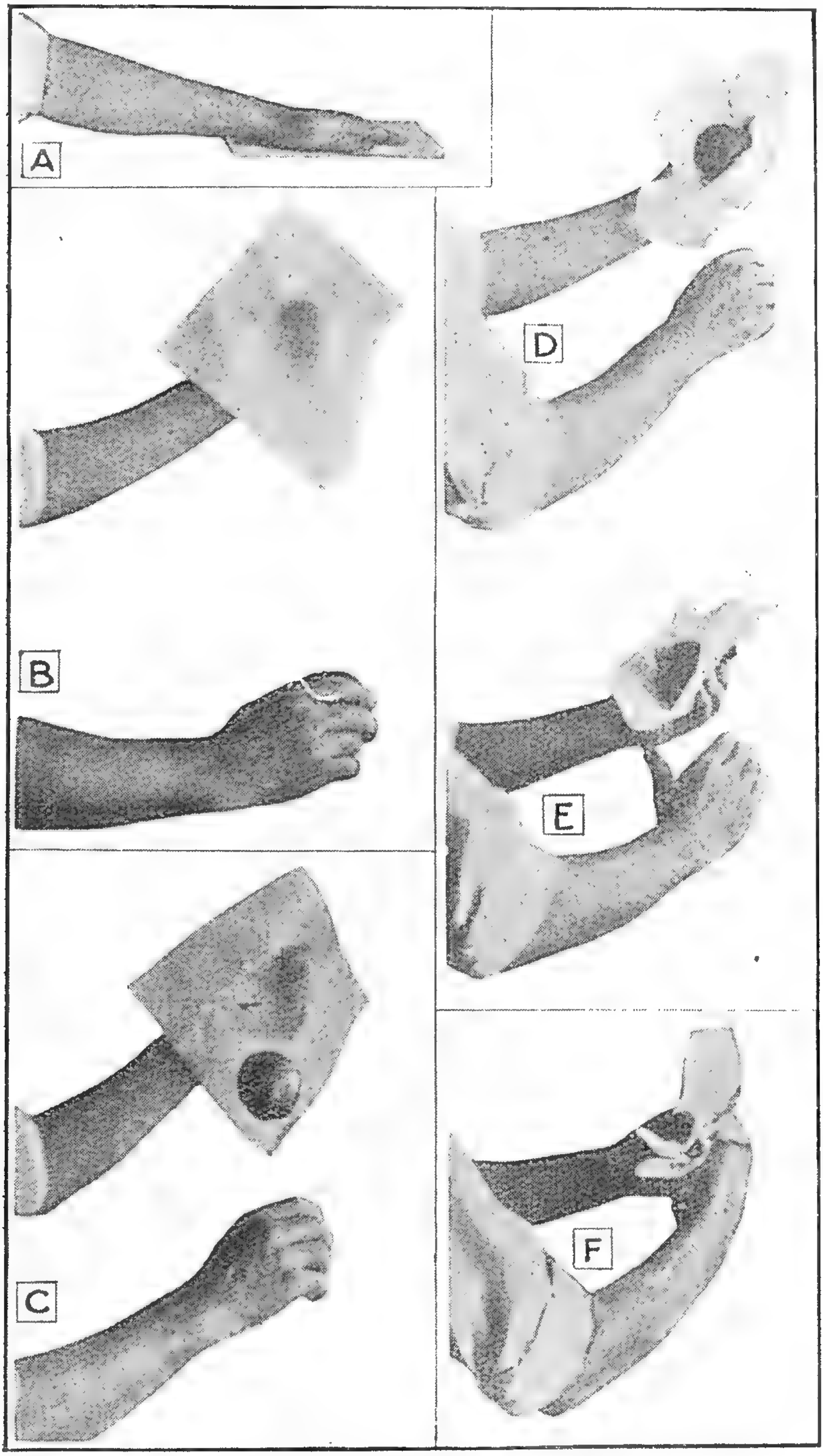


PLATE 33.—METHOD OF WRAPPING AN APPLE.

(A) Picking up the wrap; (B) Picking up the apple; (C) Throwing the apple into the wrap; (D) Position of apple when striking wrap; (E) Wrapping process, first stage; (F) Wrapping process, second stage.

if the wrap is picked up with the right hand and the apple with the left the motions would be reversed. Most apple packers use the general method described, although there are some variations in the details. Beginners should be warned against forming habits in the operations which result in lost motion, for such habits are difficult to overcome. Experienced packers will pack apples about as fast as they can pick them out of the bins. The average packer will pack from 100 to 125 boxes of machine-sized fruit in a day, but packers have been known to pack over 200 boxes in ten hours.

Packers on no account should use the grab pack, which is done by picking up a sheet of paper in one hand, then grabbing an apple with the sheet of paper still in the hand, giving the paper a rough twist with

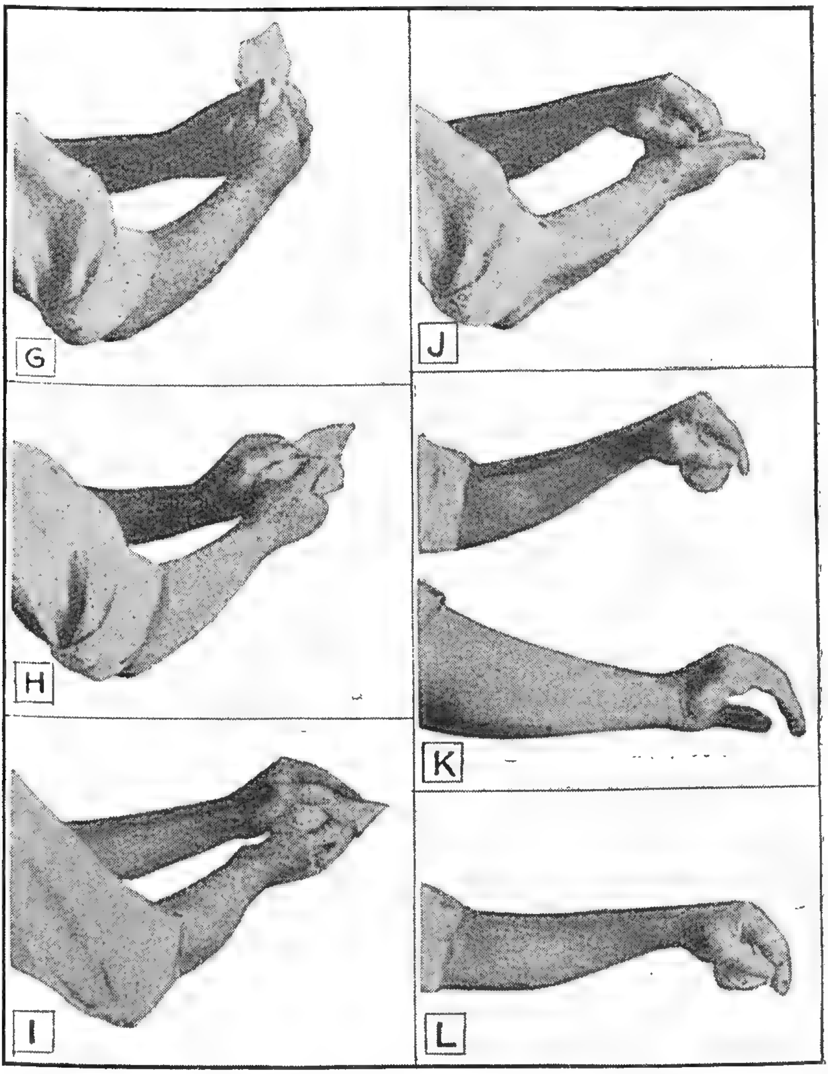


Plate 34.—Method of Wrapping an Apple—*continued.*

(G) Apple held tighly in right hand, pressing apple against cup formed by left hand; (H) Apple turned within cup formed by left hand, both wrists turning toward right; (I) Hands turning over completely; (J) Back of left hand upward back of right hand downward; (K) Apple ready for placing in box, right hand reaching for next apple; (L) Placing wrapped apple in box.

the other hand, and placing it in the case. This pack usually leads to an untidy-looking packed case.

Wrapping has many advantages, some of which are—

(*a*) It prevents the spread of rots and mould in transit;

(*b*) Prevents individual fruit from being bruised;

(*c*) Gives a snug pack, making the keeping of the fruit in each layer easier, thus enabling packing to be done at a faster rate;

(*d*) Gives a better appearance to the finished package; and

(*e*) With fancy wraps has a better advertising value.

Wrappers.

Fancy wraps are another extra that usually amply repays the cost. Growers should remember that it is of little use using fancy wraps and coloured labels if the operations of grading and packing are not well carried out. Labels and wraps can be of immense value to good consignments, but they will also react the other way if the best is not put into the quality of the fruit, &c. Many growers who are not in the position to have fancy wraps printed, to get away from the ordinary methods use coloured wrappers. These are attractive and well worth while. It is essential that all consignments of fruit overseas be carefully wrapped. Oiled wraps to control scald are strongly recommended for Granny Smith and Jonathan. The following sizes of paper are recommended for use:—

2 in. to 2½ in. apples— 9 in. x 9 in. = approx. 2,880 sheets to 7 lb. ream.

2⅝ in. to 2⅞ in. apples—10 in. x 10 in. = approx. 2,300 sheets of 7 lb. ream.

3 in. and over—11 in. x 11 in. = special size.

(This size of apple is not suited for export.)

The packs shown for each shape have been thoroughly tried out in the Stanthorpe district over a four-year period and should present no difficulty.

Case "Get-up."

Having taken care in packing, growers should complete a good job by giving careful attention to the outside appearance of the finished case. A well-chosen fancy label is an attraction and an asset, being a cheap advertising medium, the average coloured label costing very little. Growers not marketing fruit in sufficient quantity to warrant an outlay on labels may still make their cases look attractive by neat stencilling. Where growers as individuals are not in the position to obtain labels, an economical means of obtaining the use of a label is for a number to join together and obtain a designed label with a common district brand design, only the grower's name and address (which could be added by rubber stamp) differing on each grower's label. This enables a quantity of labels to be procured, thus cheapening the cost. A label must have the grower's or packer's (i.e., packing house) name or brand and address, the address to include the word "Australia" in ½-inch letters. Spaces should also be left to include the variety, number or size of fruit, and grade standard; rubber stamps can be procured to insert these particulars after packing. It is recommended to brand on the label the count in preference to the size. Labels made 8½ by 11 inches in size will fit either the Standard or the Dump case end.

Label Paste.

Good flour paste is satisfactory for applying labels. The paste is applied to half a dozen case ends at a time. The labels, which are soaked in a can of water, are drained and given an application of paste on their backs, placed on the pasted ends, and gently rubbed with a damp rag. A satisfactory paste is made from flour as follows:—Take 1 lb. of flour, ½ oz. alum, and 1 pint water. Mix into a thick paste and then add boiling water until the paste thickens, stirring all the time. If too much boiling water is added, making the paste too thin, boil slowly, adding a little more flour. If to be used immediately the paste can be made without the alum, or by adding a small quantity of bluestone as a preservative can be kept for short periods. If bluestone is added, use only an enamel or glass paste container to prevent corrosion.

If using stencils only and marketing in Queensland, under the Fruit and Vegetables Act it is necessary for the packer to brand his initials, name and address, legibly and durably within a space measuring not less than 5 inches long by 2 inches wide. The name of the variety of fruit and the size or count must also be branded in letters of not less than half an inch in height. When sending overseas the word "Australia" must be included in the address.

Cases should be branded so that as little confusion as possible is caused to loaders and checkers during transit. A good system is to brand as follows:—

One End—Shipping or Agent's Number.

Examples:

409 LONDON	W.A. 12 BRIS.
(Export)	(Local)

Opposite End—Grower's name and address, Variety, Number, and Grade.

Example:

J. JONES, Stanthorpe, Queensland, AUSTRALIA. EXTRA FANCY. G.S. APPLES 125

(Export or Local Market)

Good branding should be neat, and should not show stencil ink smudges from running the brush over the edges of the stencil plate; make your stencils with a good margin around the lettering to prevent this.

Wire Strapping.

Wire strapping the packed case is always recommended. Wire strapping is an insurance against ullage and damage from bad handling. Some packers are not careful about this operation. The wires should be put on the cases neatly, running parallel with the edge of the end of the case. The wire should be placed around the box just off the inside edge of the end of the case. Wires placed too near the centre of

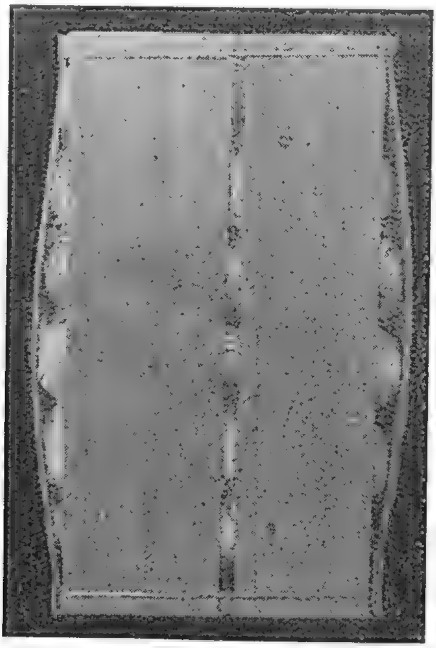


PLATE 35.—METHOD OF PLACING WIRES AROUND THE CASE. (Note bulge on fruit.)

the case are likely to pull the timber in too tightly and damage the fruit. When there is a bulge on the case they are not able to grip the timber of the box unless put on too tightly with the consequence as the fruit shrinks and the bulge gets smaller the wires become loose and are easily removed, thus defeating the object for which they were intended. When wiring, the machine should never be placed on the lid or bottom but on the side where there is no bulge.

Export Requirements.

Growers intending to export should make themselves familiar with the following:—Export Regulations embracing the requirements for Fruit, Cases, and Packing.

I have dealt with the requirements for harvesting, disease elimination, and quality. A copy of the Grade Standards may be procured from the Department of Commerce, 419 Collins street, Melbourne, C1. This should also embrace the casemaking requirements for case timbers, corrugated cardboard, and woodwool, branding, &c. It is necessary that all cases packed for export be lined, top, bottom, and sides, with woodwool or corrugated cardboard, which can be specially procured cut to size. The modern corrugated cardboard is recommended in preference to woodwool. Care must be taken to place the corrugations turned outwards away from the fruit, otherwise marking of the fruit will take place

during transit. An advantage corrugated boards have over woodwool is that the use of the boards cannot be abused in the same manner as woodwool through placing too much on the bottom and top of the fruit. Woodwool is often used with a thick layer placed on the top and bottom of the fruit to make up a deficiency of fruit through bad packing. Where practices of this nature are used the obvious result is shortage of weight in the fruit, which must of necessity cause dissatisfaction overseas. Buyers overseas expect a minimum weight of 40 lb. to the case when packed, a weight which is easily obtainable with good packing. Consignments for local market occasionally show this abuse of the correct use of woodwool, to the detriment of prices.

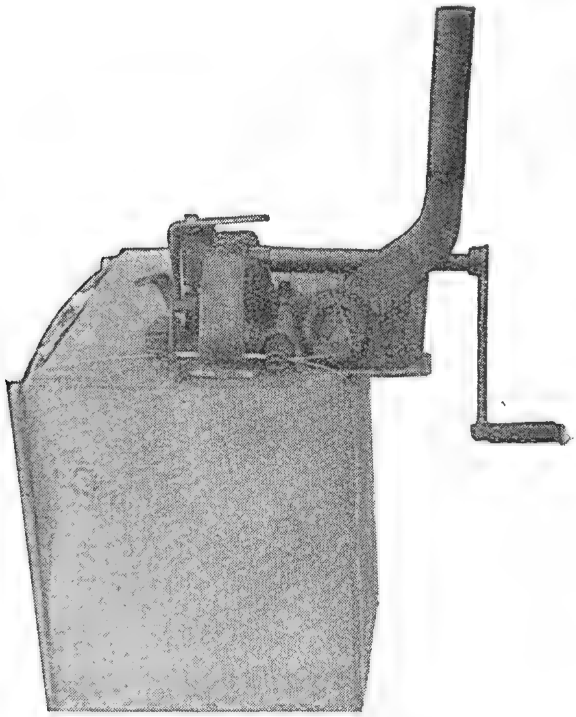


PLATE 36.—METHOD OF PLACING WIRING MACHINE.
(Observe the amount of overlap allowed the handle of the machine. This allows free movement whilst the wire is being tightened.)

Nailing Down.

Care must be taken when nailing down to place battens beneath each end of the case to allow the bottom boards to bulge when the pressure is applied to the fruit. A case-lidding press properly used is a fine implement for shed use. Where cleats are used for the Standard case they sometimes have a tendency to dry and split when nailed. This can be overcome by placing the cleats in a container of water a few minutes before nailing. Nails should be nailed through both cleat and timber of the lid of the box, the same nails being used to nail both.

Stacking in Trucks and Carts.

It is often noticed that growers and carters do not take care in carefully stacking packed cases in trucks and on carts. Cases should always be stacked on their sides where there is no bulge, the thicker timber giving added protection to the fruit. Carters or salesmen should

on no account use cases of packed fruit to sit on when driving along or selling. All of these faults have been noticed by the writer during his travels through orchards, railway-yards, packing-sheds, and markets.

Essential Points to Observe for Packing Successfully for Market and Storage.

1. Handle all fruit carefully during all operations.

2. Pick only matured fruit of good quality and count for the variety.

3. Remove all rejects as far as possible in the orchard and on the sorting conveyor before the sizing operation takes place.

4. Eliminate the marketing of all unprofitable unpopular varieties.

5. Always do standard packs and counts that are known to the buyers.

6. Keep all machinery and buildings thoroughly cleaned up of waste and fly-stung fruit. Spray working parts with a 5 per cent. solution of water and formalin periodically.

7. See that all nails, splinters, screw heads, or other projections on cases, sizing machines, &c., are removed.

8. Make sure that all corners and sides of sizing bins are padded.

9. Have sizing machines running at the correct speed for the particular type of apple, flat or deep, that is to be sized.

10. Wrap all consignments where possible and always when they have to travel any distance.

11. Place corrugated boards on top, bottom, and sides of cases.

12. Take every care when handling and stacking packed cases.

Storage.

Storage may be divided into two classes, common storage and cold storage. The Stanthorpe district's cold dry-aired winter climate permits of some varieties giving fair results with common storage. Granny Smith, Dunn's, and Stewart's Seedling are the varieties that can be handled under these conditions. This type of storage becomes risky and wasteful after eight weeks and is not commercially advisable. Only small lots should be kept and care should be taken to see that the boxes have a free circulation of air all around, the bottom boxes being stacked on battens to permit this. Green varieties stored in this way turn to a yellow colour which is not popular with buyers. The fruit also becomes greasy and if care is not taken light dust from the air will adhere to it, spoiling the general appearance for marketing. Before stacking fruit for storage all floors and walls whereon or whereby the fruit is stacked should be sprayed with a 5 per cent. solution of Formalin to destroy any traces of rots or fungi that may have accumulated from damaged or waste fruit running over the floors, &c.

Commercial Cold Storage.

Cold storage consists of two systems, air circulation or direct expansion. Both systems have points to recommend them. It is considered by many that the direct expansion system does not cause the same amount of shrinkage in the fruit as the air circulation. This

remains to be proved. The main essential for successful storage is harvesting the fruit at the correct time. All apples must be fully matured for successful storage, although care must be taken to see they are not overmatured. Overmatured fruit has only a short storage life before internal breakdown takes place. Immature fruit is more prone to develop Bitter Pit and Apple Scald. Stanthorpe apples appear to have only a medium cold storage life, and it is recommended that only hard varieties such as Granny Smith and Dunn's be stored. Whilst many varieties will store for different periods, it must be remembered by the grower that it is unprofitable to store any variety that shows waste on removal from the cold chambers. Consideration must also be given to the fact that it is not only necessary to store fruit for a period, but the fruit must be capable of keeping in good condition after removal from storage long enough for distribution and consumption. Inspection of stored apples has shown that immaturity is the greatest fault. Seasonal variations prevent any definite dates for harvesting being fixed. It would appear that cold-storing Granny Smiths picked before the fourth week and Dunn's before the second week in March gives a risk of the fruit being immature. Jonathans from the Granite Belt, it would appear, have only a short storage life, developing waste in storage after June to an extent that makes them unprofitable. Delicious have a slightly longer storage life. Where storage is carried out I would recommend the following system of inspection to be rigidly adhered to —April and May, twenty-one-day inspections; June-July, fourteen-day inspections; August-September, weekly inspections. Storage after September begins to show a much higher percentage of waste. In the Southern States the most satisfactory system of storage is by a chain of local co-operative stores where the fruit is placed unwrapped into storage in cases and packed out for market as required. As this system of co-operative local cold stores does not prevail in Queensland, growers of necessity pack their fruit before storing so that greatest advantage can be taken of the space paid for. This system has the disadvantage of making it hard to eliminate the waste, especially when only, as in successful storage, a small percentage of waste develops. Buyers take advantage of this waste, if not removed, to offer lower prices. It is advisable, to control Scald, to use oil wraps, particularly for Granny Smiths. A storage experiment conducted over a period of a whole harvesting season showed the following results in Scald control:—

Sulphite Paper Wraps	29·8 per cent. affected
Unwrapped	21·5 per cent. affected
Oiled Wraps	13·5 per cent. affected

Fruit sprayed with White Oil one week before storage developed very little Scald.

Sweating.

	Per cent. affected.
Unsweated	31·8
Sweated fourteen days	14·6
Sweated twenty-eight days	10·5

Weather conditions had an effect on the harvesting period experiments, which did not give any definite indication of procedure, but as previously mentioned in the control of Bitter Pit it is absolutely imperative that fruit be matured before storing. The experiment has showed that

wrapping fruit for transit and storage assists in eliminating case bruising. Where fruit is stored unwrapped the addition of oiled shredded paper placed amongst the fruit will give a measure of scald control.

The main essentials of successful storage are as follows:—

(1) Select only sound fruit with unbroken skins and stalks intact.
(2) Store only fully matured apples.
(3) Handle carefully during all operations.
(4) Use oiled wraps on all varieties of apples susceptible to storage scald.
(5) See that inspections are made periodically.
(6) Remove fruit from storage, and market if signs of storage troubles develop.
(7) Do not attempt to store fruit for too long a period.

In conclusion, some notes on marketing will possibly not be amiss. The keynote of successful marketing is sending regular consignments of graded fruit to the same centre. Buyers soon learn to ask for graded lines of fruit, hence the reason for regular weekly consignments to enable one's brand to always be procurable. Careful grading of first and second quality fruit is necessary to keep and secure goodwill. Consignments of mixed first and second quality are always paid for on the basis of the lowest quality in the case, a basis that usually is unsatisfactory to all parties—grower, agent, and consumer. The consumer is the one to be satisfied. Satisfaction to the consumer should ensure satisfaction to the grower and agent per medium of better prices. A sufficiently supplied market of good fruit will always return better and more profitable prices than an over-supplied market glutted possibly through the small percentage of poor quality fruit. To secure satisfactory and profitable conditions for all, it is necessary that all strive to give the maximum of quality coupled with the maximum of efficiency in get-up and handling. It is only by doing this that the apple industry will prosper and become one of the great assets to the country that are necessary for us to hold our rightful place amongst the leading countries of the world.

(TO BE CONTINUED.)

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Packing-house Management.

By J. H. GREGORY, Instructor in Fruit Packing.*

THIS is a subject that to many growers of fruit appears to be of little importance. Generally speaking, the importance of clean packing-houses is not as fully appreciated as it might be. It is not generally realised by agents handling fruit that a lot of the rots or fungi affecting fruit whilst stored in the market sections could be greatly minimised if more care was taken on the section. As in the packing shed, so in the market section, much fruit is affected by coming in contact with the spores from what has been left behind of decayed fruit impregnating the floors, &c., of the section. This infection of the fruit generally takes place through portions of fruit that have been damaged during handling whilst in transit to the markets.

Retail storerooms also could be treated with advantage to the buyer. Our first consideration in the operation of a good packing shed should be the layout and equipment. This can be done in such a manner as will enable the methods advised in the following remarks to be carried out with a minimum of time and labour.

The most economical and time-saving way of laying out a packing shed is in such a way that the work will progress from one side to the other without hindrance. This is achieved by receiving the fruit at one side of the building, placing it on the sizing machine or grading table, packing it, and delivering it to the wagons at the other side. Growers with small sheds can use a modification of this system. It must be always borne in mind that it is impossible to efficiently conduct or keep hygienically clean any packing shed, private or otherwise, unless a systematic method of working is adopted. It should be easily understandable that inefficiency and slowness of handling must materially increase the amount of breakdown and waste in fruit, with a higher risk of infection to following consignments.

Machinery is now becoming more generally used throughout the fruit industry. Sizers, washing and drying machines are increasing in number every week. Machinery of any description should be so placed in the shed that it is easy to attend and keep clean. Care must be taken to have all things, such as nails, splinters, sharp corners, &c., effectively padded, smoothed off, or covered to eliminate all chances of damage to fruit. The same should be done with orchard boxes and picking utensils. A periodical treatment of these utensils will greatly assist in eliminating the risks of decay during transit, as the source of infection is greatly reduced. A 1 in 20 solution of formalin and water is quite an effective spray for the machinery, walls, and floors of packing-houses. Walls can be sprayed at lengthy intervals, floors monthly, and sizing machines and brushers weekly. Remember, prevention is better than cure!

While this talk has a general application to all packing sheds, growers of various kinds of fruits will find different difficulties to contend with in their packing sheds and storerooms.

With citrus fruits we find that the most common storage and transport development is the so-called blue mould. This common name is

* In a radio address from Stations 4QG (Brisbane) and 4RK (Rockhampton).

not altogether correct, as actually there are two distinct moulds that appear under the common name. They are, giving the common names, blue contact mould and common green. They differ in the following characteristics:—

> *Blue Contact Mould.*—Blue forming on the surface and also inside the fruit. Wrapping paper not readily adhering to the fruit.
>
> *Green Mould.*—Olive green forming on surface only. Wrapper adheres closely to the rotting fruit. This is the most prevalent of the two moulds.

As the green mould depends mostly on skin injuries for its means of infecting fruit, it can readily be seen how necessary it is to eliminate all sources of skin injury, such as nails, screws, splinters on sizing machines, &c.

Blue contact mould, as the name suggests, will spread by infected fruit coming into contact with other fruit. From this will readily be seen the need for destroying all infected fruit as soon as possible. How often do we see cases of waste citrus fruits left in odd corners of the packing sheds? Where fruit is sweated for periods and odd specimens become infected, care should be taken to keep these specimens from going on to sizing machines, as they will leave spores on the machinery to infect other fruit as it travels through the machine. It is not my intention to deal at length with all the storage and transit rots which careful methods of handling should practically eliminate. Spraying the machine with a 1 in 20 solution of formalin weekly, coupled with the periodical shed treatment as previously mentioned, is recommended. Orchard picking boxes, if used, should be dipped occasionally in a 1 to 100 solution of lime sulphur.

Tomatoes.

Irish blight, as it develops to a large extent in the field, is one of the worst troubles we have to contend with. Keep the sheds and plantations clear of all infected fruit, which should be carefully destroyed. Use separate picking containers to gather infected specimens. Do not use second-hand cases. Spray packing and sorting tables weekly.

Stone Fruits.

Brown rot is by far the worst trouble encountered whilst handling any fruit, its effect being so rapid. I have seen apparently sound fruit packed, and three hours after the fruit was unsaleable. Coupled with adequate field measures, the same control as used for Irish blight should prove effective. It must be remembered that the use of second-hand cases plays a large part in transmitting these diseases from one place to another. Where picking boxes are used, a periodical dipping in a 1 to 100 solution of lime sulphur is of great assistance. Care must be taken during handling to eliminate skin injuries, as these are often the first source of infection. Other transit rots are also caused by bruising and bad handling.

Apples and Pears.

Rots of the more virulent type do not trouble these fruits to the same extent as citrus and stone fruits. Careful handling all the time to avoid skin damage is giving very successful results. Where fruit is stored in the shed for a period of weeks, the walls and floors should be first treated with formalin. Skin damage is the usual cause of decay

starting in these fruits. It is usual for the bottom cases of stacked fruit to show a higher percentage of waste, due possibly to neglecting to treat the floors before stacking.

Packing sheds are also the means frequently of increasing the infection of an orchard by codling moth. Care should be taken to thoroughly examine all buildings and equipment for this pest, which uses cracks and corners in which to over-winter. Treatment with hot water will be of assistance. All orchard cases can easily be dipped in a tub of hot water at the end of the season.

While there are many more diseases one could mention, it will be found that the treatments recommended for the most general troubles will, as a rule, prove satisfactory in controlling our other transit and storage rots.

NOTICE TO SUBSCRIBERS.

SPECIAL AND IMPORTANT.

Under the Commonwealth Postal Regulations it is NO LONGER PERMISSIBLE to indicate the expiry of subscriptions with a BLUE CROSS on the first page of the Journal. So in the future that reminder will NOT appear.

The need for the strictest economy makes any other form of reminder at present impracticable. THE ONUS OF REMEMBERING THE DATE OF EXPIRY OF, AND RENEWING THE SUBSCRIPTION PROMPTLY IS, THEREFORE, PLACED ON EACH SUBSCRIBER.

As about 1,000 subscriptions expire each month, the cost of a postal reminder is, in present circumstances, prohibitive. Readers will, therefore, appreciate that fact, and will, no doubt, help us to retain their names on our mailing list by kindly noting the date of payment of their subscriptions and, on expiry, sending in their renewals at once.

Instead of just sending the annual subscription—one shilling—along, it is suggested that, when renewing, they do so for two or three years, or even a longer term. For instance, FIVE SHILLINGS would keep a name on our subscribers' register for FIVE YEARS.

By doing this subscribers would help greatly in reducing clerical labour, as well as avoid the inconvenience to themselves of posting annually the very small sum necessary for their registration.

Readers renewing their subscriptions should USE THE ORDER FORM on another page, which should be filled in FULLY and CORRECTLY. Renewals by letter do not as a rule give the essential information, thereby causing unnecessary waste of time and much inconvenience. The Form is also our record, and orders which come by letter require special handling to adapt them to our card recording system.

When an address on the Order Form is not that to which the Journal has hitherto been sent, attention should be called to the new address, and the former address given. This assists us to identify subscribers, of whom we have many of the same name, often in the same district, as well as in different parts of the State.

Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

Dairy Fodder Plots.

By A. E. GIBSON, Director of Agriculture, and C. S. CLYDESDALE, Senior Instructor in Agriculture.

The subjoined notes are reprinted in response to numerous requests from readers in several districts in the State. They are of particular interest and value at the present time.—ED.

THE majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimbah Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the summer months.

No fertilizers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

PLATE 37.—PRINCE WHEAT AND VETCHES AT MR. A. HOASE'S FARM, YANDINA.

PLATE 38.—PRINCE WHEAT AND VETCHES AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487	13
April	453	13
May	213	11
June	792	9
July	652	6
August	31	2
September	205	12

Cultivation.

At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and later on, in March, was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

The plot at Nindooimbah was fallowed during the summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.

The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disked" in, the cereals being sown on the disked surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early-maturing varieties.

Description and Varieties on North Coast.

The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 feet in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 feet at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 feet high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 feet in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 feet in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 feet 6 inches in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 feet in height.

Plots at Nindooimbah.

Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

[The varieties of wheat mentioned in the foregoing (Prince and Patriot) are now somewhat difficult, if not impossible, to obtain, but Warren and Warchief—two well-known wheats at present in use throughout the wheat-growing areas of Queensland—may with confidence be recommended as substitutes.

Similarly, Sunrise oats may be substituted for Ruakura, a variety of oats not always readily obtainable.]

Skinless and Cape Barley.

During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape Barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

Ruakura and Algerian Oats.

The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust.

Rye.

Owing to its early-maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 feet in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the Spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.

Barley was sown at the rate of 50 lb. per acre.

Oats were sown at the rate of 40 lb. per acre.

Rye was sown at the rate of 60 lb. per acre.

Field peas were sown at the rate of 30 lb. per acre.

Vetches were sown at the rate of 20 lb. per acre.

PLATE 39.—PATRIOT WHEAT AND FIELD PEAS AT MR. P. E. BURTON'S FARM, BRIDGES, N. C. LINE.

PLATE 40.—KUDZU VINE (FODDER PLANT) ON A FARM NEAR BRISBANE.

RESULTS.

Varieties.	YIELDS PER ACRE OF GREEN FODDER.		
	A. Hulse, Yandina.	F. G. Burton, Bridges.	J. B. Stephens, Nindooimbah.
	T. C. Q. LB.	T. C. Q. LB.	T. C. Q. LB.
Prince wheat and peas	16 16 2 12	2 14 0 2	13 10 0 10
Prince wheat and vetches	10 16 0 8	6 1 2 4	11 17 2 20
Patriot wheat and peas	16 4 0 12	9 2 0 0	14 0 3 16
Patriot wheat and vetches	11 6 3 4	2 0 2 1	12 18 1 26
Rye and peas	10 16 0 8	5 5 1 9	14 11 2 22
Rye and vetches	7 11 1 0	Destroyed by wallabies	16 4 0 22
Cape barley and peas	12 3 0 9	10 16 0 8	13 10 0 10 (two cuttings)
Cape barley and vetches	7 11 1 0	2 19 1 19	15 2 2 0
Skinless barley and peas	11 6 3 14	Destroyed by wallabies	5 18 3 10
Skinless barley and vetches	5 13 1 21	Destroyed by wallabies	5 2 2 15
Ruakura oats and peas	9 9 0 7	4 3 2 25	18 18 0 14
Ruakura oats and vetches	7 11 1 0	Destroyed by wallabies	17 16 2 2
Algerian oats and peas	8 18 1 1	3 6 0 19	9 3 2 18
Algerian oats and vetches	6 15 0 5	Destroyed by wallabies	9 14 1 24

The yields generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

PLOTS AT TOOGOOLAWAH.

For some years the Department of Agriculture has endeavoured to interest dairymen and stockowners generally in the matter of fodder provision for their herds during those periods when, by reason of the lack of succulence in the natural pastures, yields from their herds have been considerably lessened, and, in some cases, even reduced within measurable distance of vanishing point.

The practice of arranging with interested farmers to carry out trials designed and supervised by officers of the Department, has met with a good deal of success. The results to date have clearly shown that by early and careful preparation heavy returns are readily available of rich, succulent, milk-producing fodders, and that a continuity of this class of food can in normal seasons be kept up to tide milch cows over periods during which their productivity is affected by the gradual depression, induced in each animal's system, by being called upon to make use of rough grasses of low nutritive value, at a time when weather conditions were at their worst.

Ocular evidence has shown that improved milk supplies and a correspondingly improved return from the factory is inducement enough for other neighbouring farmers to profit by the example of the one who first adopted the system of growing crops regularly, for his dairy stock —actually, on a farm, an inexpensive method of maintaining an income.

In the present crop trials carried out on Mr. T. Coleman's property at Toogoolawah, no fertilizers of any kind were used. The plots were situated on well-prepared alluvial soil near Cressbrook Creek, which had been under cultivation for a number of years.

The plots were sown on 31st March, 1925, and were harvested for yield-computing purposes on 30th July, 1925; consequently, each yield submitted represents four months' growth of fodder, and judged on this basis may be considered as highly satisfactory.

A more vigorous growth was noticeable in the case of Florence wheat and peas or tares and the Skinless barley with a similar mixture, both of which were well out in ear and rapidly maturing; rye had made a dense growth in both instances, but only a few heads were to be seen, and probably a further three or four weeks would be required to bring it to a similar state of maturity to that obtained by the Florence wheat at date of harvesting. The following yields were recorded:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Florence wheat and peas	7	14	1	4
Cape barley and peas	9	11	1	0
Skinless barley and peas	10	15	1	0
Rye and peas	8	10	1	12
Algerian oats and peas	8	3	3	20
Canary seed and peas	11	8	0	24
Florence wheat and tares	7	4	2	16
Cape barley and tares	9	0	0	0
Skinless barley and tares	11	1	3	4
Rye and tares	12	13	3	20
Algerian oats and tares	10	15	1	12
Canary seed and tares	8	10	1	12

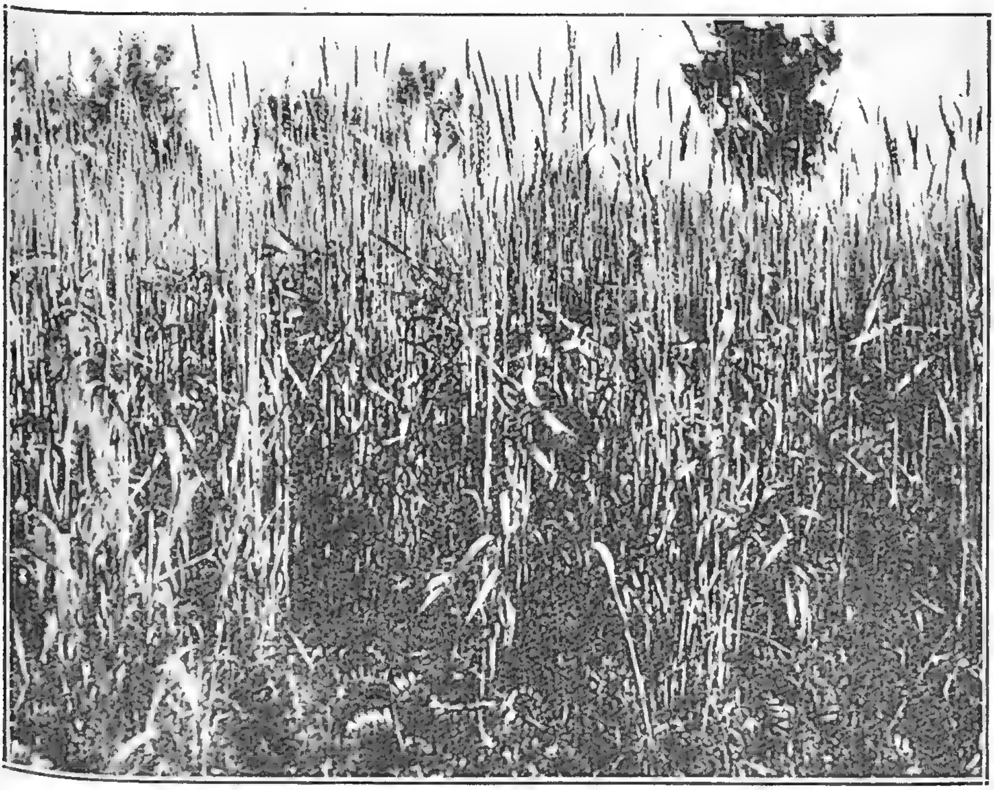


PLATE 41.

FLORENCE WHEAT AND TARES. Yield—7 tons 4 cwt. 2 qr. 16 lb. per acre.

In view of the fact that some of the plots might be regarded as too immature for the purpose of obtaining the maximum yield, further

weighings for comparative purposes were made on the 24th August, with the following results:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Algerian oats and peas	11	9	3	12
Rye and peas	8	13	2	8
Canary seed and peas	7	17	2	0
Algerian oats and tares	13	19	2	6
Rye and tares	9	9	2	16
Canary seed and tares	13	14	3	8

When selecting fodders for the test, cognisance was taken of their respective periods of maturity so that a continuity in the supply of green fodder might be kept up. Obviously the grower, by using judgment in the matter of arranging for succession sowings, should readily be able to maintain his supplies, and in this way ensure a more regular state of productivity in his herd.

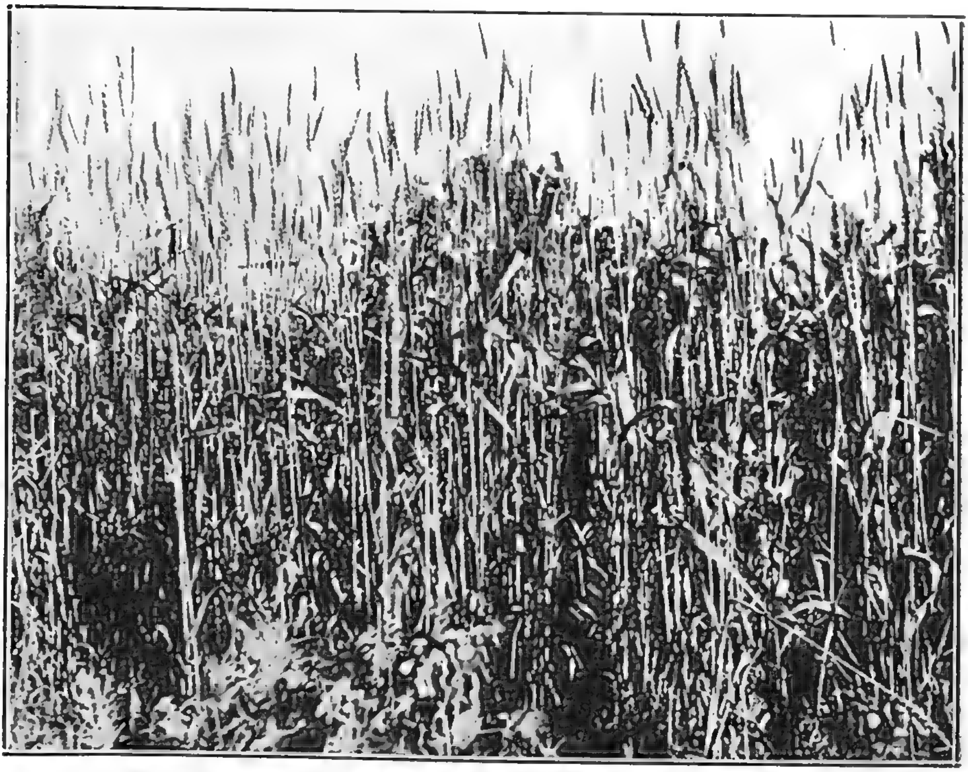


PLATE 42.
FLORENCE WHEAT AND DUN FIELD PEAS. Yield—7 tons 14 cwt. 1 qr. 4 lb. per acre.

Observations made respecting the period of development of the different crops were as follows:—Florence wheat and Dun field peas were ready for use earlier than any other single crop or combination, followed by crops in the order named: Florence wheat and tares, Skinless barley and peas, Cape barley and peas, Skinless barley and tares, Cape barley and tares, Rye and peas, Rye and tares, Algerian oats and peas, Algerian barley and tares, Canary seed and peas, Canary seed and tares.

Observations made indicate that it is advisable when arranging for mixtures of crops to confine the sowing of peas to the early-maturing cereals—Florence wheat, Skinless and Cape barley—as the peas begin to lose weight as they approach maturity. Tares, on the other hand, have a longer growing period and retain their succulence better than the field peas; consequently, they are more suitable for use with Algerian oats, Canary seed, and Rye.

To those dairymen who are interested in maintaining supplies to their respective factories throughout the winter period, the following quantities are recommended for use in connection with the above class of fodders:—

Wheat 30 lb., Dun field peas or Black Tares 20 lb.
Barley 40 lb., Dun field peas or Black Tares 20 lb.
Rye 30 lb., Dun field peas or Black Tares 20 lb.
Oats 30 lb., Dun field peas or Black Tares 20 lb.
Canary seed 10 lb., Dun field peas or Black Tares 20 lb.

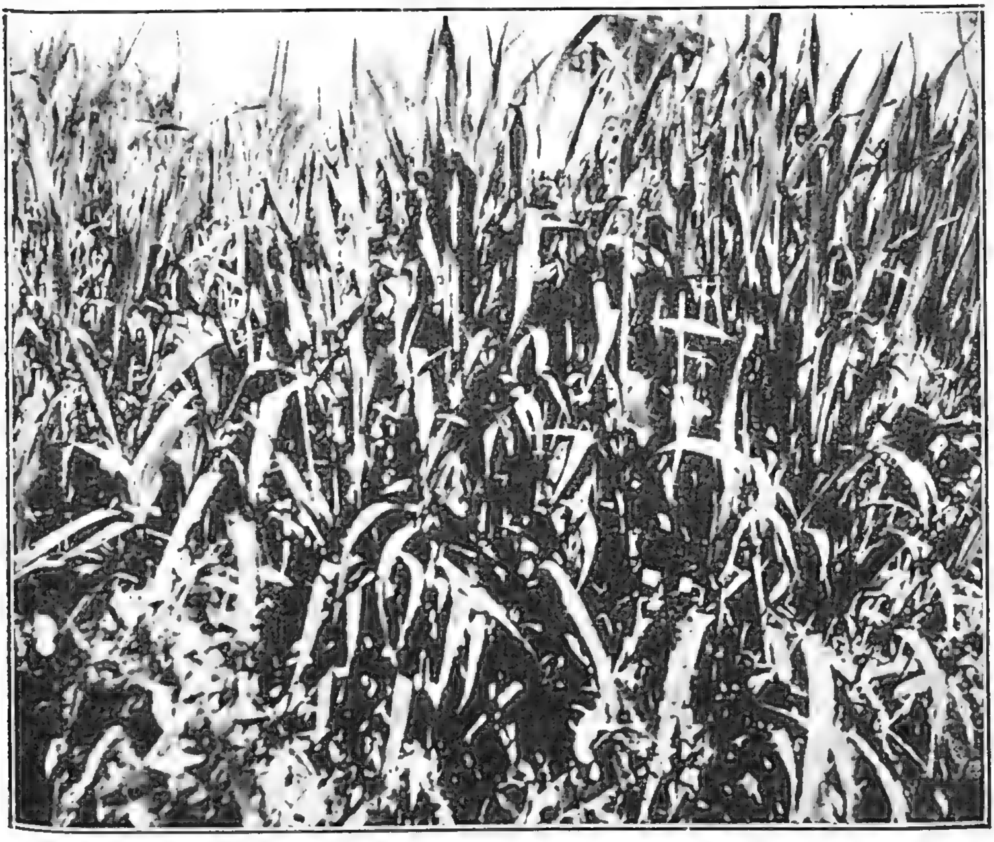


Plate 43.
Cape Barley (in short blade stage) and Dun Field Peas.
Yield—9 tons 11 cwt. 1 qr. per acre.

DRY SEASONS—A COUNTERING FIELD CAMPAIGN.

The loss of national wealth to this State brought about by periods of drought cannot be accurately estimated by figures—but their effects

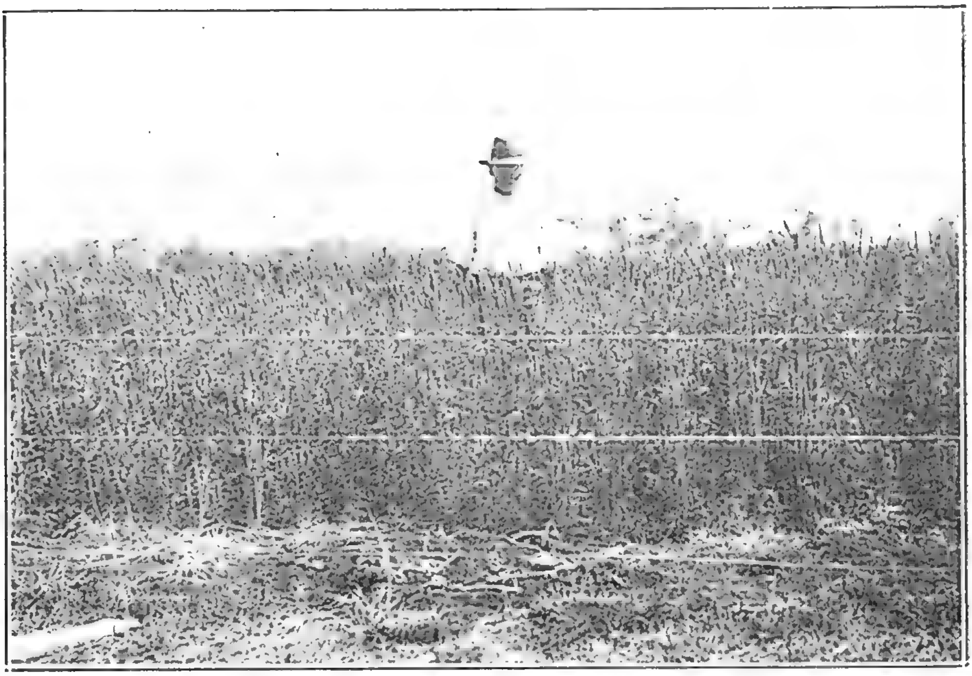


PLATE 44.—PEAS AND PILOT WHEAT ON MR. F. W. THIEDEKE'S FARM AT BEAUDESERT.
Weight 10 tons 17 cwt. 2 qr. 19 lb. per acre.

PLATE 45.—PEAS AND FLORIDA WHEAT ON MR. F. W. THIEDEKE'S FARM AT BEAUDESERT.
Weight—11 tons 17 cwt. 2 qr. 20 lb. per acre.

PLATE 46.—PILOT WHEAT AND PEAS AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

are undoubtedly far-reaching. If action can be taken over certain areas whereby increased production can be brought about, it naturally follows that dry periods are robbed to some extent of their devastating influences and the loss to the State as a whole is decreased. A policy of this kind is naturally educative in its character to all, but when certain sections are dealt with it becomes more particularly of value to those directly interested, and this is increased when illustrations are given for the purpose of proving the policy advocated.

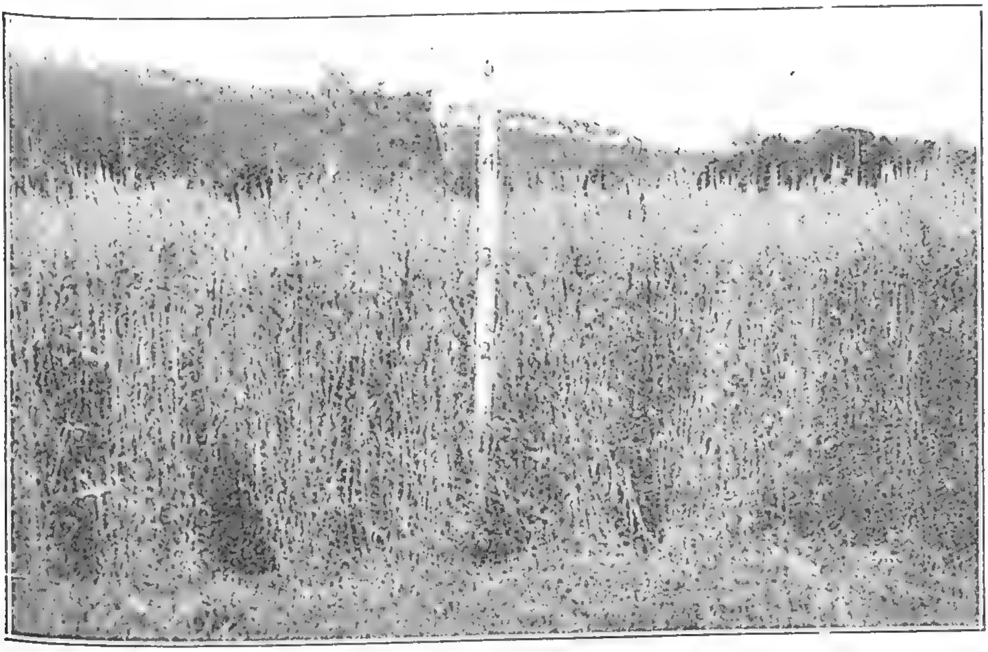


PLATE 47.—FLORIDA WHEAT AND VETCHES AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

For some time past the Department of Agriculture and Stock has interested itself in increased production of dairy and allied products, and with this object in view has initiated a series of fodder trials in various districts for the purpose of pointing out that if means are adopted for the annual provision of fodder crops for dairy stock and pig raising, the fluctuations which have in the past taken place in the supply of these products will be considerably reduced if not entirely removed.

During the past few months the losses to dairymen and others, brought about by lessened production resultant of the dry period experienced, amounts to a considerable value, and attention is drawn to the fact that these can be considerably reduced by adopting the policy of careful soil preparation and the sowing of crops calculated to fill the void caused by the absence or decreased supplies of natural grasses and herbage.

It was with such an object that dairy and pig fodder trials were established on the farms of Messrs. F. W. Thiedeke and Peel Caswell, of Beaudesert and Wangalpong respectively, and results obtained so far from portions of these plots have proved the soundness of the principle involved. Both farmers are capable agriculturists, whose methods of cultivation leave little to be desired, and who are fully seized of the importance of fallowing and thoroughly preparing their land prior to seeding operations. The results obtained on the comparatively low rainfall experienced at Wangalpong speak for themselves; and whilst the soil at Beaudesert is of a heavier nature than that met with in parts of the Canungra Valley, the heavier rainfall experienced more than compensated for the difference in soils and their moisture-retaining qualities.

The plots were planted on the 9th and 10th June at Mr. Thiedeke's at Beaudesert whilst those at Mr. Caswell's at Wangalpong, were planted on the 12th and 14th of June, rainfall experienced between the 9th June and 23rd September (the date of harvesting) at Mr. Thiedeke's being 3·66 inches, but it must be noted that a fall of 1·06 inches was experienced on 7th June, two days prior to planting. At Mr. Caswell's the rainfall received between the 12th June and 24th September totalled ·91, the previous rains to that date being 1·25 inches, registered on 14th and 17th May.

The following weights of green fodder were recorded:—

	Mr. F. W. Thiedeke, Beaudesert.					Mr. P. Caswell, Wangalpong.			
	Tons.	cwt.	qr.	lb.		Tons	cwt.	qr.	lb.
Florida wheat and peas ..	11	17	2	20	..	7	6	1	22
Florida wheat and tares ..	10	8	3	13	..	7	4	0	5
Pilot wheat and peas ..	10	13	2	19	..	8	5	2	17
Pilot wheat and tares ..	10	4	0	7	..	6	12	0	5
Skinless barley and peas ..	11	8	0	8	..	6	4	3	10
Skinless barley and tares ..	4	16	0	3	..	7	1	2	16
Cape barley and peas ..	6	2	1	21	..	4	18	1	20
Cape barley and tares ..	9	7	1	1	..	4	16	0	3
Rye and peas	5	15	0	27	..	4	16	1	20
Rye and tares	8	0	3	11	..	3	7	0	25

The varieties of wheats used in the trials were Pilot, a Bunge-Florence crossbred, and Florida, a Bobs-Florence crossbred, both of which were raised at Roma State Farm. These varieties made excellent

growth, and were remarkably even throughout the trials. At the time of harvesting both varieties were in the flowering stage, averaging 3 feet 6 inches in height.

At Wangalpong both Pilot and Florida showed signs of flag-rust, but at Beaudesert no signs of rust were apparent. This was probably due to local conditions and to the fact that humidity in the Canungra Valley is greater than in the more open areas around Beaudesert.

Cape Barley.—This crop made fair growth and when harvested was in the shot-blade stage—the height averaging 1 foot 9 inches of good healthy growth. From the general appearance of the crop a later cutting will give a heavier yield.

Skinless Barley was a clean and attractive crop, averaging 3 feet in height, which had made a remarkable growth of foliage. When harvested the grain was in the soft dough stage.

Rye.—In each case this crop made rapid growth, and was in the flowering stage when harvested, averaging 3 feet in height. Generally speaking, growth was somewhat on the thin side, and heavier quantities of this cereal should be sown when the season is somewhat advanced, as it was in this particular instance.

Field Peas in all plots made fair average growth of 1 foot 6 inches in height. When harvested they showed signs of wilting, thus reducing the weight per acre that under other conditions would have been recorded.

Vetches, usually rather slow in maturing when compared with peas, made favourable growth.

The pig fodder plots were not sufficiently far advanced in growth on 23rd September to justify their harvesting; consequently, this matter was deferred till 24th November, but during this period a further rainfall of 326 points was received and recorded as follows:—25th September, 32 points; 28th September, 166 points; 16th October, 46 points; 25th October, 9 points; 16th November, 73 points; total, 326 points.

As a result increased growth was in evidence compared with that shown on the occasion of the previous visit.

As in the case with the dairy plots, Mr. Caswell had given careful attention to the cultivation of the various fodders, and an entire absence of weed growths was noticeable.

The various yields recorded can be regarded as valuable illustrations of what can be accomplished by careful and systematic cultivation of crops that are suited for purposes of economic pig-feeding and can be produced at little cost to the grower.

The following are the yields recorded:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Thousand Headed kale	11	15	3	3
Dwarf Essex rape	6	9	2	16
Yellow Glode mangles	29	8	1	20
Long Red mangles	23	19	2	12
Purple Top Swede turnips	14	18	0	27
Elephant Swede turnips	12	13	3	18
Sugar beet	17	6	2	12
White Belgian carrots	12	13	3	18

The Dwarf Essex rape suffered somewhat from the attacks of Aphis, whilst the foliage of the Swede turnip was subjected to the attentions of the Rutherglen Bug; otherwise the crops were excellent in every respect.

Economic Geography of Sugar.

By C. V. HIVES, B.A.

The following is the full text of an address delivered by Mr. C. V. Hives, of "The Australian Sugar Journal," under the auspices of the Educational Broadcasting Committee of Queensland, being one of a series of lectures on the Geography of some Important Primary Products; and broadcast from Stations 4QG (Brisbane) and 4RK (Rockhampton).

THE two chief sources of raw sugar are the sugar-cane and the sugar-beet. The world produces some 25 million tons of sugar per annum, two-thirds of which is derived from sugar-cane and one-third from sugar-beet. The refined sugar of commerce made from either of these two sources is precisely the same commodity, though it is marketed in various forms, such as lump sugar, granulated, and so forth. The sugar-cane has been known since time immemorial, and to-day is cultivated within a climatic range covering both tropical and sub-tropical regions. Botanically it is a gigantic grass resembling a bamboo and well known to most Queenslanders. The sugar-beet is a sweet root of the same species as the ordinary garden beet-root, but it is white, not red. It is grown for sugar production in most European countries, including Russia, and in parts of the United States of America. A glance at the map of the world will show that the 50th parallel of latitude in the northern hemisphere runs through the beet belt in both Europe and North America.

Sugar, in one form or the other, is now being produced in at least sixty different countries. An exhaustive study of the subject would entail a survey of mankind, literally, from China to Peru. The mere geography, including climatic factors, is comparatively a simple matter to explain. The important factors which have determined the present distribution of sugar production throughout the world are political, historic, and economic. In the production of sugar national policies have always played a particularly important part, more important than in the case of any other primary product. This is a fact that must always be borne in mind in any study of sugar as a world commodity.

A convenient way of approaching the subject, perhaps, is to outline the rivalry that has prevailed for the last century and more, and is still prominent to-day, between cane-sugar and beet-sugar. Here we have the interesting feature of direct competition between the agricultural production of tropical and temperate zones. The commercial commodity itself is identical, but produced from two very dissimilar plants growing respectively under two very different sets of geographical conditions. Cane-sugar might be described, not inaccurately, as crystallised sunlight, and the tropical zone with its hot, moist weather is the natural home for its production. In the case of beet, the bright light of direct sunlight is not necessary for sugar formation, the diffused light from a cloudy sky being found to be suitable. This has been demonstrated in recent years by experience in Great Britain. This double origin of sugar—from the tropical and temperate zones—means that the area of supply is very widely distributed. Fluctuations of world production due to climatic factors alone are therefore relatively small.

The potential and actual yield of sugar from cane is considerably higher than from beet. Beet-sugar, however, has always owed both its development and its maintenance to tariffs and subsidies which have enabled it to withstand the competition of the tropical product. It is true that in recent years cane-sugar has also been fostered in some countries, so much so that probably three-quarters of the world's total output of sugar to-day receives some form of protection or preference. There is little doubt that were all forms of production to be withdrawn, the production of beet-sugar would shrink to very small dimensions and in many countries would disappear altogether. Sugar-beet, however, is an important rotation crop, and its position in European agriculture is further strengthened by the value of its by-products in the feeding of livestock.

Historical Review.

The establishment of the beet-sugar industry was really due to Napoleon. As part of his campaign against England, he declared an embargo against any merchandise entering the Continent from England or her colonies. America and the West Indies were then the chief sources of sugar, and Napoleon thus cut off supplies from Europe. He then set aside large tracts of land for beet-raising and compelled the peasant farmers to cultivate beets. Great difficulty, however, was experienced in the first attempts to manufacture sugar from this new source. It was only the power exercised by Napoleon and his determination to outdo the English that brought this new industry into existence. In the end Great Britain reigned supreme at sea, and on the downfall of Napoleon in 1815 the ports of Europe were thrown open to cheap cane-sugar from the Colonies. The newly-established beet industry which had spread over Germany, France, and Austria, was unable to hold its own, but the various Governments concerned came to the rescue and fostered it in every possible way. Then the cane-sugar industry suffered a severe setback owing to the abolition of slavery in most of the European colonies. Twenty or thirty years elapsed before the planters became accustomed to the new state of affairs. This transition period coincided with the artificial extension of the beet industry, which was encouraged and supported by bounties and privileges of all kinds. The production of cane-sugar remained almost stationary, but the beet-sugar industry in Europe gradually increased so that at the end of the last century it accounted for nearly two-thirds of the world's total sugar supply.

Sugar, and its chief by-product, rum, played an important part in the early history of the last century. "In their tropical climate," says one writer, "the West Indian planters had learn to distil from the sugar-cane the most warming and comforting spirit for a damp and capricious climate that Nature could devise." Rum, for more than two centuries, has been a naval ration, the allowance to an ordinary seaman at one time being half a pint a day. Nelson's body was brought home from Trafalgar preserved in the only cask of rum left on board the "Victory." The battered remnant of the crew were obliged to "broach the Admiral" on the way home to save their own lives. "Draw on, my heartiest!" says the shade of Nelson in "The Dynasts," "better I shrivel than you famish!" Rum, in fact, according to another writer, was a foundation of British sea-power. At any rate, British sea-power at that time undoubtedly determined to a large extent the future trend of sugar production throughout the world at large. The history of sugar and its chief by-product is a picturesque one. Rum was the

currency of the slave-trade, which in turn was the backbone of the sugar industry. It was also the currency of the Colony of New South Wales for some years. The West Indian Islands loomed large on the map of those days.

Coming to more recent times, we find at the outbreak of the Great War that world sugar production had increased to 18 million tons, of which the tropics were supplying a little more than one-half. Of the total world consumption, however, about four-fifths is accounted for in temperate lands. The big consumers are countries like the United States of America, the United Kingdom, Germany, and France. The War caused a great decline in the production of Europe, including Russia, not only by the fact that military operations were carried out over the actual sugar-beet areas, but still more through the general disorganisation of the Continent. By 1920 cane-sugar was supplying 80 per cent. of the total world consumption, and the tropics reaped a rich harvest at the expense of Europe. The world price of sugar soared and a great expansion of the industry took place in countries like Cuba and Java.

Gradually the European beet industry recovered, and the proportions of cane-sugar and beet-sugar, as previously mentioned, are now respectively two-thirds and one-third. This revival in Europe coincided with the coming into full production of new plantations in the tropics which had been stimulated by the war price of sugar. The result has been serious over-production, leading to an unprecedented depression in world sugar prices.

Sugar's Present Position.

We can now survey more closely the position as it is to-day in various parts of the world.

Starting with Europe, we find some fifteen different countries producing beet-sugar in quantities more or less sufficient for their own needs. Chief amongst these are France, Germany, and Czechoslovakia.

The position in Great Britain requires special consideration. Her consumption is over two million tons of sugar per annum, an increasing proportion of which is now being derived from her own beet industry. This industry has been gradually established only during the last ten years or so, but annual production now approximates half-a-million tons. The cost to the British Treasury, however, represents some £6 millions per annum. It is a remarkable example of the trend in Britain towards self-sufficiency as regards food production, irrespective of purely economic considerations. The general policy of Great Britain with regard to sugar affords also an interesting example of how the normal flow of commerce may be completely changed by tariffs and other similar measures. Twenty years ago she was importing the whole of the two million tons she required, 80 per cent. of which was beet-sugar from the Continent. To-day she is providing 25 per cent. of her requirements within her own borders. Nearly 40 per cent. of the imported sugar (representing three-quarters of a million tons) is derived from Empire sources, Australia and South Africa and the Crown Colonies of Mauritius, the West Indies and British Guiana all contributing their share. The balance is obtained from tropical countries such as Cuba and Peru.

This diversion of supplies has been effected through a tariff designed to exclude refined sugar and at the same time to encourage the importation of raw cane-sugar from Empire sources. It should be mentioned

here that Great Britain's total imports of sugar are still actually two million tons, but she now re-exports about 400,000 tons in the form of refined sugar. The various sources of her supply of this commodity and her general policy in relation thereto afford a most interesting lesson in economic geography, international trade, and the effects of tariff policies.

As to future developments, in the European beet countries the principal areas of production are already fully exploited. The greatest potentialities in the beet zone are within the vast area covered by the Soviet Union of Russia. Production in a normal year under present conditions would be about one and a-half million tons of sugar, leaving some for export. According to the second five-year plan, production is to reach seven million tons by 1937. This may appear excessive, but it should be remembered that the main objective of the first five-year plan was to develop a highly industrialised economy. Everything, including agriculture, was sacrificed to this. In the future, we may expect to see more attention given to the agricultural resources of the country, including the beet-sugar industry. There is apparently an almost unlimited area of land available for beet cultivation. A recent official report, for example, states that new sugar factories are under construction in Central Asia and in Southern Siberia. This serves to remind us that the area covered by the U.S.S.R. is equal to that of the whole British Empire. The population is at least 150 millions, increasing at the rate of two millions per annum, and the present level of consumption per capita is very low.

We next turn our attention to the United States of America, including those islands which are under her jurisdiction. Normal consumption within the United States of America is six million tons per annum. Like Great Britain, she obtains about one-fourth of her requirements from her own domestic beet industry, supplemented, however, by a certain amount of cane-sugar produced by the Southern States of the Union. The balance, all in the form of cane-sugar, is imported from Cuba and from her oversea possessions, the island of Puerto Rico, the Hawaiian Islands, and the Philippine Islands. The United States of America in the past has indulged in an expansionist policy and, like Great Britain, she has commercial Empire problems of her own. These are concerned very largely with the sugar industry. The problem of the Philippines affords good illustration of this. These islands formerly belonged to Spain, and following on their acquisition by the United States of America, a great expansion took place in the production of sugar, which had become entitled to the right of free entry into the States. This expansion was not favourably regarded by opposition sugar interests in the United States of America, who used all their influence to further the movement for granting independence to the Filipinos. This is now due to take place in ten years' time, when the right of free entry into the United States of America will be finally withdrawn. Philippine sugar will then have to face the open competition of the world's market. An economic reaction seems inevitable which may have far-reaching effects in the political sphere. These islands have been owned by two different nations within the last generation. They are by no means fully exploited and they lie midway in the direct route between Japan and Northern Australia. Japan, it may be mentioned here, obtains most of her sugar from Formosa, an island in the China Sea, which is part of the Japanese Empire. The Empire in this respect now approaches self-sufficiency.

If we follow the tropic zone round the globe, starting with the Philippines, we find that these islands, together with Java, Australia, Hawaii, Cuba, Santa Domingo, Puerto Rico, the West Indies, Peru, and Mauritius, are the principal exporters of sugar. It will be noticed that nearly all these places are islands. The most suitable climate for sugar-cane is one where hot moist weather alternates with periods of hot dry weather. It is very much at home, therefore, in mountainous islands inside the tropics. Of the total world production of cane-sugar 70 per cent. is produced within the tropic zone. Until quite recently Cuba was the outstanding producer of sugar in the whole world, production in that country having reached five million tons in 1929. Great as are its advantages in soil and climate, it was proximity to the United States of America and a favourable tariff with that country that allowed Cuba to develop its natural resources to the full. As production within the tariff wall of the United States of America (including the island possessions) increased, the market for Cuban sugar contracted. The price fell to below cost of production. A scheme for international limitation of production was initiated, but this proved a failure. Then followed a series of political revolutions, the net result of all this being that Cuban production of sugar dropped last year to only two million tons.

Java was, until recently, the next largest producer with three million tons. The industry here is a model of organisation, efficiency, and scientific research, for which the Dutch are responsible. Formerly, all the sugar produced was exported to the Netherlands for refining. With the abolition of tariff preference, this market was lost. For a time Great Britain and the United States of America took the place of the mother country. These markets in turn were lost owing to the trade policies of these two countries. For many years past Java has had to rely mainly on the markets in India, China, and Japan, but recently the growth of protective barriers in the East has jeopardised her market in this quarter of the globe. Last year her production of sugar was little more than half-a-million tons. All the natural geographic advantages possessed by Java and all her efficiency have proved unavailing against the new tariff of India and the developments arising therefrom.

India is the great continental sugar-cane country, the crop being grown chiefly in sub-tropical areas in small plots by peasant cultivators. Methods in agriculture are crude, but a great expansion has taken place during the last two years. Under the shelter of a new protective tariff, modern factories are springing up everywhere. Imports of sugar, formerly one million tons per annum, chiefly from Java, are rapidly approaching vanishing point. India now heads the list of all sugar-producing countries and with a very low cost of production and efficient management she may yet enter the export market.

This completes our brief survey of the sugar world. We started with Europe, crossed to America, traversed the tropics, and ended with India. In dealing with Europe, we touched on the projected extension of the beet industry into Central Asia. This area, it will be noticed, is not far distant on the map from Northern India, so we have thus completed the circle of the globe.

Summary.

Summarising the position with regard to these various countries, we find that India, owing to the decline in the size of the Cuban crop, now

holds the leading position amongst sugar producers. In the production of beet-sugar, the U.S.S.R. has by far the greatest potentialities. Neither India nor Russia, however, is in a position at present to export. If that stage should ever be reached by both these countries, a new and interesting phase of the rivalry between beet-sugar and cane-sugar may be looked for. The production of India is based on individual peasant economy, backed largely by British capital and British technique in the factory. The production of Soviet Russia is on a collectivist basis with mechanisation applied to the field. Mass production in agriculture, in fact, is contemplated. All this, however, is a matter of speculation, and lies somewhat outside the realm of statistics and economic geography.

So far as the other principal countries are concerned, the following summary represents some of the recent trends in production during the last five years. The output of Cuba and Java taken together has declined by over 60 per cent., while that of India has increased by more than 60 per cent. Production of sugars within the United States of America, including its overseas territories, has increased by 50 per cent. Similarly, the increase within the British Empire, taken as a whole, but exclusive of India, amounts to 30 per cent. The production of beet-sugar throughout Europe generally has declined by 20 per cent. The position of Cuba and Java emphasises the fate that to-day awaits an export country which lives in economic isolation. It is countries which live within protected groups, such as the British Empire or the United States of America, that have been able to expand production. Recently, within these two groups competition for the market of the motherland, as between members of each group, has become manifest. Both Great Britain and the United States of America are now faced with the problem of allocating quotas amongst the various members of their respective families. The flow and direction of international trade increasingly depends upon such things as commercial treaties, preferences, and import quotas.

Australia.

Finally there remains Australia to be considered. Here we have a series of widely separated cane districts stretching from latitude 17 deg. in Queensland to the 30th parallel in New South Wales. The industry originally started in sub-tropical areas, but as the Northern districts became more accessible, it gravitated naturally to the tropics. About 85 per cent. of the total Australian production of sugar is now within the tropic zone. To show the climatic range in Australia, it may be mentioned that beet-sugar to a small extent is being produced at Maffra in Victoria. Incidentally, this appears to be the only beet-sugar produced in the Southern hemisphere.

As in many other countries, the industry here is protected on national grounds, but these grounds have a special validity in the case of Australia. As the present Prime Minister recently stated, the people willingly subscribe to the cost of the sugar industry, because they believe in the White Australia policy. They do so on particular national grounds because on the coastal margin of North Queensland it it sugar or nothing. Under this policy the industry has expanded to a remarkable degree. A considerable export trade has been built up with the mother country under a preferential tariff designed to encourage the production of sugar within the Empire. Production is now over 600,000 tons per annum. Australia, in fact, is to-day the largest producer of

sugar within the British Empire, except only India. A similar development of the industry has been noted in the various overseas possessions of the United States of America.

A feature that has been generally overlooked is the tendency of Australia towards imperial expansion on its own account. The Australians are an enterprising race with a genius for putting names on the map. Not content with their own vast continent, they have explored Antarctica and acquired Papua. Their energies range from the Equator to the South Pole. In this sugar has played its part. It was from New Guinea many years ago that a Queensland expedition obtained the best variety of sugar-cane then known to the world. Individual Queenslanders in recent years have successfully established the industry in Kenya, East Africa, just below the Equator, at a height of 4,000 feet above sea-level. In the South Pacific Australia has established a species of Monroe doctrine. The Fiji Islands, for instance, a British Crown Colony, are practically owned by Australia. The sugar industry is the backbone of these islands, and the industry there is an entirely Australian enterprise.

The features just mentioned are in conformity with the general history and development of most cane-sugar countries. The unique feature that distinguishes the Australian industry is that it embodies in itself a definite national policy, and this has resulted in the achievement of something that is new in the history of the world. The white races have frequently invaded the tropics, but in almost every region their penetration failed. Now we are told by Dr. Grenfell Price, a leading authority on the subject, that "to the utter astonishment of the scientists of all nations we have established a working population of 150,000 white people in North-Eastern Queensland—the largest population of working Nordics in any part of the tropics." Apart from any question of material production or economic geography, this is an achievement of which Australia in general, and Queensland in particular, can be justly proud.

STUD PIG PURCHASES.

Included among prize-winning stock from the Melbourne Centenary Show purchased by Queensland breeders of stud pigs are a pair of very fine quality Berkshire sows secured by Miss Jean Handley on behalf of the Bon Vale Stud at Murphy's Creek. The purchases include the first prize Berkshire sow in class four months old and under. This sow, "Clethorpe's Rosie" was bred by that well-known stud master, Mr. T. White, of Clethorpe, Victoria. She is a nice lengthy sow with a nice head and well developed quarters. Another sow, "Dookie Elsa," a product of the stud at Dookie Agricultural College, is sired by "Dookie Valet" (8876), and from "Dookie Disdain" (11602), both well-known families unrelated to those bred by Mr. T. White.

Other purchases were made on behalf of Mr. W. S. Hendry, of the Ascot Vale Stud, Clifton, and by Mr. Percy V. Campbell, of Lawn Hill, Lamington, Queensland, who with Mr. J. A. Heading, of Murgon, attended the Melbourne Show and Stud Pig Breeders' Society meetings as delegates from the Queensland branch of the Stud Pig Breeders' organisation. Mr. Heading also made some purchases for his Highfields Stud.

The periodical introduction of fresh breeding stock of improved type does much to assist, but there is a big field of work ahead, and it is hoped before very long a much more representative shipment of stud pigs will be secured from countries overseas, for the pig industry has developed to such an extent and is of such importance as to warrant money being spent in introducing further stock.

CROP PLANTING TABLES FOR QUEENSLAND.

NUMBER OF PLANTS REQUIRED TO PLANT AN ACRE OF GROUND AT GIVEN DISTANCES.

	Plants.		Plants.
3 in. × 12 in.	174,240	18 in. × 42 in.	8,297
6 in. × 6 in.	174,240	18 in. × 48 in.	7,260
6 in. × 9 in.	116,160	20 in. × 24 in.	13,068
6 in. × 12 in.	87,120	20 in. × 30 in.	10,454
9 in. × 9 in.	77,440	20 in. × 36 in.	8,712
9 in. × 12 in.	58,080	20 in. × 42 in.	7,467
12 in. × 12 in.	43,560	20 in. × 48 in.	6,534
12 in. × 15 in.	34,848	2 ft. × 2 ft.	10,890
12 in. × 18 in.	29,040	2 ft. × 3 ft.	7,260
12 in. × 24 in.	21,780	2 ft. × 4 ft.	5,445
12 in. × 30 in.	17,424	2 ft. 6 in. × 3 ft.	5,808
12 in. × 36 in.	14,520	3 ft. × 3 ft.	4,840
12 in. × 42 in.	12,446	3 ft. × 4 ft.	3,630
12 in. × 48 in.	10,890	3 ft. 6 in. × 3 ft.	4,148
15 in. × 18 in.	23,232	4 ft. × 5 ft.	2,178
15 in. × 24 in.	17,424	4 ft. × 6 ft.	1,815
15 in. × 30 in.	13,939	4 ft. × 8 ft.	1,361
15 in. × 36 in.	11,616	4 ft. × 10 ft.	1,089
15 in. × 42 in.	9,956	4 ft. × 12 ft.	907
15 in. × 48 in.	8,712	6 ft. × 6 ft.	1,210
18 in. × 18 in.	19,360	6 ft. × 8 ft.	907
18 in. × 24 in.	14,520	6 ft. × 10 ft.	726
18 in. × 30 in.	11,616	6 ft. × 12 ft.	605
18 in. × 36 in.	9,680		

The omission of the last figure will give the number required for 16 perches.

TABLE OF EQUIVALENT QUANTITIES OF MANURES.

Per Acre.	Per Square Perch, Approx.	Per Square Yard, Approx.
1 ton	14 lbs.	$7\frac{1}{2}$ ozs.
10 cwt.	7 ,,	$3\frac{3}{4}$,,
5 ,,	$3\frac{1}{2}$,,	2 ,,
4 ,,	$2\frac{3}{4}$,,	$1\frac{1}{2}$,,
3 ,,	2 ,,	1 ,,
2 ,,	$1\frac{1}{2}$,,	
112 lbs.—1 cwt.	$11\frac{1}{4}$ ozs.	
84 ,,	$8\frac{1}{2}$,,	
56 ,,	$5\frac{1}{2}$,,	
28 ,,	$2\frac{3}{4}$,,	

1 Dessert-spoonful equals about 1 oz.

SOUTHERN DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant: Coastal Districts.	When to Sow or Plant: Tableland Districts.	When to Sow or Plant: Inland Districts.	How Sown or Planted: Distance Rows Apart. Ft. In.	How Sown or Planted: Distance between Plants. Ft. In.	How Sown or Planted: Quantity Seed per Acre if Drilled.	How Sown or Planted: Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
Arrowroot	Farina and pig food ..	Aug. to Oct.	..	..	5 0	2 0	Tubers or "bulbs" 10 to 12 cwt.	..	8 to 10	Suited only to coastal districts. Tropical and semi-tropical.
Artichoke (Jerusalem)	Market sale and pig food	Aug. to Oct.	Sept. to Oct.	..	3 6	1 6	4 to 5 cwt.	..	4 to 5	
Asparagus	Market sale	Aug. to Sept.	Sept.	..	4 0	1 6	7,260 roots	..	18	May also be propagated from seed sown thinly in drills and transplanted when large enough.
Barley, Cape and Skinless	Green feed	Mar. to June	Mar. to July	Mar. to June	..	..	1 bushel ..	1½ bushel ..	2 to 4	
Barley, Malting ..	Grain	..	May and June	May and June	..	..	1 bushel ..	1½ bushel ..	4½ to 5	
Beans, Broad ..	Market sale	May to June	Apr. to May	May to June	2 6	0 6	2 bushels ..	..	4½ to 5	
Beans, French ..	Market sale	Sept. to Apr.	Oct. to Mar.	Sept. to Mar.	2 6	0 6	35 lb. small 52 lb. large	seeded seeded	2½ to 3	Sowings may be made earlier and later, according to the district's susceptibility to frosts.
Beans, Lima ..	Bush	Sept. to Apr.	Oct. to Jan.	Sept. to Jan.	2 6	0 9	21 lb. small	seeded }	3½ to 4	
Do. do. ..	Runner..	Sept. to Apr.	Oct. to Mar.	Sept. to Apr.	4 0	1 0	26 lb. large	seeded }		
Beet, Garden varieties	Market sale	Feb. to Apr.	Jan. to Mar.	..	2 0	0 9	4 to 5 lb. ..	..	3 to 4	
Beet, Spinach ..	Stock food	Apr. to June	Apr. to June	..	2 6	1 0	4 lb. ..	..	3 to 4	Foliage of Spinach Beet is reproduced quickly after being cut down and is a profitable crop for fattening purposes.
Broom Millet ..	Fibre for brushware ..	Sept. to Dec.	Oct. to Dec.	Oct. to Dec.	3 6	0 9	4 to 5 lb. ..	..	4½ to 5	
Buckwheat	Bees, green manure, grain, and poultry food	Sept. to Mar.	Sept. to Mar.	Sept. to Feb.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	Produces a valuable nectar crop within 6 to 7 weeks of planting.
Cabbage	Market and cattle food	Nearly all seasons except summer	Nearly all seasons except summer	Nearly all seasons except summer	2 6	2 0	1 lb. ..	..	4 to 5	

Canary Seed ..	Hay and grain	..	May to June	May to June	..		..		15 lb. ..	..	4½ to 5	
Capsicum	Market sale	Aug. to Oct.	Sept. to Oct.	Sept. to Oct.	2	6	1	6	1 lb. ..	..	4 to 5	
Carrot, Field ..	Stock food	Mar. to June	Apr. to May	Mar. to June	1	9	..		2 to 3 lb. ..	..	4 to 5	
Carrot, Garden ..	Market sale	Nearly all seasons	Nearly all seasons	Sept. to May	1	6	..		2 to 3 lb.	..	4	
Cassava (Tapioca) ..	Starch or pig food ..	Aug. to Sept.	..	..	5	0	2	0	4,356 cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	Feb. and Apr.	Feb. to May	Feb. to Mar.	2	6	2	0	1 lb. ..	..	6	
Celery	ditto	Jan. to Mar.	Jan. to Mar.	..	4	0	0	6	4 oz. ..	..	5 to 6	
Chocos	ditto	Aug. to Oct.	..	..	Trellis		..		Chocos ..	..	4 to 5	
Cotton	Fibre	Sept. to Dec.	Sept. to Nov.	Sept. to Nov.	4	0	2	0	10 to 20 lb.	..	5 to 7	Early cultivation is essential to keep down weeds and grass.
Cow Cane	Cattle food	Sept. to Dec.	..	..	5	0	1	6	5,800 sets	..	7 to 8	
Cowpea	Grain, hay, or green manure	Sept. to Jan.	Oct. to Jan.	Oct. to Jan.	3	0	0	8	10 lb. ..	15 to 20 lb.	4 to 4½	The non-running varieties are the most suitable for grain.
Cucumber	Market sale	Sept. to Jan.	Oct. to Jan.	Sept. to Jan.	5	0	2	0	1 lb. ..	..	3	
Egg Plant	ditto	Sept. and Oct.	Sept. and Oct.	Sept. and Oct.	3	0	3	0	1 oz. for 1,000 plants	..	6	
Garlic	ditto	Aug. to Sept.	Aug. to Sept.	..	1	6	0	6	..	..	6	
Ginger	ditto	Aug. to Sept.	..	..	3	0	1	0	5 to 6 cwt.	..	10	
GRASSES—												
Cocksfoot	Pasture	..	Apr. to May	..	..		..		..	1½ bushel ..		
Elephant Grass ..	Green fodder before the stems harden	Aug. to Oct.	..	..	5	0	2	6	(3,432) cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable. Also propagated from seed.
Italian Rye Grass	Pasture	..	Apr. to May	..	..		..		..	2 bushels		
Paspalum	ditto	Sept. to Jan.	Sept. to Jan.	..	..		..		..	8 to 10 lb.	4 to 6	Sow in rainy season.
Perennial Rye Grass	ditto	..	Apr. to May	..	..		..		..	2 bushels		
Prairie	ditto	Apr. to May	Apr. to May	Apr. to May	..		..		..	1½ to 2 bus.	4 to 5	
Rhodes	ditto	Sept. to Jan.	Sept. to Jan.	Sept. to Jan.	..		..		..	4 to 5 lb. ..	4 to 6	Sow in rainy season.
HERBS—												
Lavender	Perfume	Aug. to Sept.	Aug. to Sept.	..	4	0	2	0	..	..	12	Propagated from seed or by division of rootlets.
Marjoram ..	Seasoning	Aug. to Sept.	Aug. to Sept.	Aug. to Sept.	2	6	0	6	..	..	3	Propagated from seed or by division of rootlets.
Mint	ditto	Aug. to Sept.	Aug. to Sept.	..	..		..		..	..	2	Propagated by rootlets only.
Parsley	ditto	Nearly all seasons	Nearly all seasons	..	2	6	..		1 lb. ..	..	2½ to 3½	

SOUTHERN DISTRICTS—*continued*.

Crop.	Purpose for which Grown.	When to Sow or Plant: Coastal Districts.	When to Sow or Plant: Tableland Districts.	When to Sow or Plant: Inland Districts.	How Sown or Planted: Distance Rows Apart.	How Sown or Planted: Distance between Plants.	How Sown or Planted: Quantity Seed per Acre if Drilled.	How Sown or Planted: Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
					Ft. In.	Ft. In.				
HERBS—*continued.*										
Sage	Seasoning	Aug. to Sept.	Aug. to Sept.	..	2 6	0 9	2 lb.	..	3	Propagated from seed or by division of rootlets.
Thyme	Seasoning	Aug. to Sept.	Aug. to Sept.	Aug. to Sept.	2 6	0 6	..	..	3	Propagated from seed or by division of rootlets.
Kale	Stock food	Feb. to June	Feb. to June	..	3 0	2 0	1 lb.	..	4	
Kohl Rabi	Market sale, stock food	Mar. to Apr.	Mar. to Apr.	..	2 6	1 6	2 lb.	..	4 to 5	
Leek	Market sale	Feb. to Apr.	Feb. to Apr.	..	2 6	0 6	2 lb.	..	6 to 8	Transplanted when the leeks are the size of goose quills.
Lettuce	ditto	All seasons	All seasons	..	2 0	0 9	½ lb.	..	3	During dry periods of year sow in drills and thin out.
Linseed (Flax)	Fibre and grain	May and June	May and June	..	Drilled	..	30 lb. for grain 60 lb. for fibre	..	4½ to 5	Can be treated as an ordinary white cereal crop and harvested with reaper and binder.
Lucerne	Fodder	April to May	April to May	..	Drilled	..	12 to 14 lb.	16 to 20 lb.	1½ to 2	First cutting should take place as soon as the plant will stand up to the mower and before it flowers.
Maize	Grain and silage	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 0	1 3	8 to 10 lb.	..	4 to 5	If sown on the "check row" system weeds are more easily dealt with.
Mangel and Sugar Beet	Stock food	Feb. to Apr.	Mar. to June	..	2 6	1 0	5 to 7 lb.	..	6 to 7	
Marrow, Vegetable	Market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 to 8 feet	4 0	2 lb.	..	3 to 4	Distance apart and time of maturing according to variety grown.
Melon, Rock	ditto	Aug. to Jan.	Sept. to Dec.	Sept. to Dec.	4 to 6 feet	2 0	1 lb.	..	3	Distance apart and time of maturing according to variety.

Melon, Water	Market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 to 6 feet	2 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Millet, Foxtail varieties, these include the so-called Giant Panicum	Fodder	Sept. to Jan.	Oct. to Jan.	Sept. to Jan.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain and green fodder	Sept. to Jan.	Sept. to Jan.	Sept. to Jan.	Drilled	..	7 to 8 lb. ..	..	1½ to 2	A useful catch crop.
Mustard	Market sale	All seasons ..	All seasons ..	..	Sown in beds		for salad use	..	..	For farm use, see remarks under Rape.
Oats	Grain and fodder ..	Apr. to June	Apr. to June	Apr. to June	Drilled	..	1¼ bushel ..	1½ to 2 bus.	3 to 5	
Onion	Market sale	Apr. to May..	Mar. to Apr.	Mar. to Apr.	1 0	..	4 lb. ..	..	5 to 6	
Panicum (White) and Japanese Millet	Silage, fodder, and grain	Aug. to Feb.	Sept. to Feb.	Sept. to Feb.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Parsnip	Market sale	Feb. to Mar.	Feb. to Mar.	..	2 0	..	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Mar. to June	Mar. to June	Apr. to June	2 0	..	½ to ¾ bus.	..	4 to 5	Usually combined with a cereal fodder crop.
Pea, Garden	Market sale	Feb. to Sept.	Mar. to Sept.	Mar. to June	2 0	..	1½ bushel ..	..	3½ to 4	Period of maturity according to variety used.
Peanut	ditto	Aug. to Jan.	Sept. to Dec.	Sept. to Dec.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	Aug. and Feb.	Aug. and Feb.	..	2 6	1 0	8 to 9 cwt.	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	3 to 3½ feet	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Fodder and market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan	8 to 10 feet	3 0	2 lb. ..	..	5 or 6	Distance apart and time of maturing varies according to variety.
Radish	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 0 apart	..	10 to 12 lb.	..	1½	
Rape	Fodder and green manure	Mar. to May	Mar. to May	..	Drilled	..	5 to 6 lb. ..	..	2½ to 4	The addition of 1 lb. of mustard seed to every 5 or 6 lb. will, if sown in conjunction, minimise the tendency of depastured animals to bloat.
Rhubarb	Market sale	Aug. to Oct.	Sept. to Nov.	..	4 0	4 0	1½ lb. ..	..	4 to 5	When propagated from roots quicker returns may be expected.
Rice, Upland ..	Grain and fodder ..	Oct. to Jan.	..	..	Drilled	..	12 to 16 lb.	..	4 to 5	
Rosella	ditto	Aug. to Nov.	Sept. to Oct.	..	4 0	3 0	Sow in beds and transplant	..	3 to 4	
Rye	Fodder	Mar. to June	Apr. to June	Apr. to June	Drilled	..	¾ to 1 bushel	..	3 to 5	

SOUTHERN DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	Tableland Districts.	Inland Districts.	How Sown or Planted. Distance Rows Apart. Ft. In.	Distance between Plants. Ft. In.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
Shallots	Market sale	Nearly all seasons	Nearly all seasons	..	1 6	0 6	..	..	3 to 4	Propagated by division of the bulbs.
Sorghum, Feed ..	Fodder and silage ..	Aug. to Feb.	Sept. to Feb.	Sept. to Jan.	3 6	0 8	4 to 5 lb. ..	..	3½ to 5	Maturity depends on variety used.
Sorghum, Grain ..	Grain	Aug. to Feb.	Sept. to Jan.	Sept. to Jan.	3 6	0 8	3 to 4 lb. ..	..	3½ to 5	
Soudan Grass ..	Fodder or silage ..	Sept. to Feb.	Sept. to Jan.	Sept. to Dec.	2 6	..	3 to 4 lb. ..	..	2	Closer planting permissible.
Soy Beans	Grain	Sept. to Jan.	Oct. to Jan.	..	2 6	0 8	8 to 10 lb.	..	3	
Squash	..	*See* Marrows	and Pumpkins.							
Swede	Market sale and stock food	Feb. to May	Feb. to May	..	2 0	1 0	2 lb. ..	..	4 to 5	
Sweet Corn	Market sale	Aug. to Jan.	Sept. to Jan.	..	3 6	1 3	8 to 10 lb.	..	3	
Tares	Fodder or green manure	Mar. to June	Mar. to June	..	Drilled	..	1 bushel ..	½ bushel to 1 bushel other grain	3 to 4	For fodder purposes is best used with some form of cereal, such as barley, wheat, or rye.
Tobacco	Leaf	Oct. to Jan.	Oct. to Feb.	Oct. to Jan.	4 0	1 ft. 8 in. to 2 ft.	1 oz. in seed beds	..	3 to 4	Plants must be raised in specially prepared seed beds and transplanted when strong enough to permanent positions.
Tomato	Market sale	Aug. to Feb.	Sept. to Jan.	Sept. to Jan.	4 0	2 0	¼ lb. ..	..	3 to 4	
Turnip, Field ..	Stock food	Feb. to June	Feb. to June	..	2 0	1 0	2 to 3 lb. ..	..	3 to 4	
Turnip, Garden ..	Market sale	Feb. to June	Feb. to June	..	2 0	0 6	2 lb. ..	..	2 to 3	
Wheat	Grain and hay.. ..	Apr. to May	Apr. to July	Apr. to June	Drilled	..	¾ bushel ..	1 bushel ..	3 to 4	Fodder purposes only on coast.

CENTRAL DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	When to Sow or Plant. Tableland and Inland Districts.	How Sown or Planted. Distance Rows Apart.	How Sown or Planted. Distance between Plants.	How Sown or Planted. Quantity Seed per Acre if Drilled.	How Sown or Planted. Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
				Ft. In.	Ft. In.				
Arrowroot	Farina and pig food	Aug. to Nov.	..	5 0	2 0	10 to 12 cwt.	..	8 to 10	Propagated by small "bulbs" or tubers.
Artichoke (Jerusalem)	Market sale and pig food	Aug. to Nov.	Sept. to Nov.	3 6	1 6	4 to 5 cwt.	..	4 to 5	
Asparagus	Market sale	Aug.	..	4 0	1 6	7,260 sets	..	18	Propagated from seed or division of roots.
Barley (Cape and Skinless)	Green feed	Mar. to June	Mar. to June	Drilled	0 7	1 bushel	1½ bushel	2 to 4	
Beans, French	Market sale	July to Apr.	Sept. to Jan.	2 6	0 6	..	35 lb. small 52 lb. large	2 to 3	
Beans, Broad	ditto	May to June	..	2 6	0 6	2 bushels	..	4 to 5	
Beans, Lima	ditto	July to Jan.	Sept. to Dec.	4 0	1 0	26 lb. large seeded	..	3 to 4	
Beetroot	ditto	Feb. to Aug.	Sept. to Dec.	2 6	0 9	4 to 5 lb.	..	3 to 4	
Beet, Silver or Spinach	Market sale or stock food	All seasons	Apr. to June	2 6	1 0	4 lb.	..	3	Useful both as a vegetable and as a stock food.
Broom Millet	Fibre for brushware	Aug. to Jan.	Sept. to Dec.	3 6	0 9	4 to 5 lb.	..	4 to 5	
Buckwheat	Bees, green manure, poultry food, and grain	Aug. to Jan.	Sept. to Dec.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	Produces a valuable nectar crop within 6 or 7 weeks of planting.
Cabbage	Market sale	Feb. to June	Feb. to June	3 0	2 0	1 lb.	..	4 to 5	
Canary Seed	Grain or hay	Mar. to June	Mar. to June	Drilled	..	15 lb.	..	4½ to 5	Also used as green stuff.
Capsicum	Market sale	Aug. to Nov.	Sept. to Nov.	3 0	2 to 3 ft.	1 lb.	..	4 to 4½	Distance apart according to variety.
Carrot, Field	Stock food	Mar. to June	Sept. to Jan.	1 9	..	3 lb.	..	4 to 5	
Carrots, Garden	Market sale	Mar. to June	Sept. to Jan.	1 6	..	3 to 4 lb.	..	3 to 4	
Cassava (Tapioca)	Starch or pig food	July to Sept.	..	5 0	2 0	Cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	Feb. to May	Feb. to May	3 0	2 0	1 lb.	..	5 to 6	
Celery	ditto	Feb. to Mar.	Feb. to Mar.	4 0	0 6	4 oz.	..	6	
Chocos	ditto	July to Nov.	Sept. to Nov.	Trellis	6 0	..	..	4	

CENTRAL DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	When to Sow or Plant. Tableland and Inland Districts.	How Sown or Planted. Distance Rows Apart. Ft. In.	How Sown or Planted. Distance between Plants. Ft. In.	How Sown or Planted. Quantity Seed per Acre if Drilled.	How Sown or Planted. Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
Cotton	Fibre	July to Oct.	Sept. to Oct.	4 0	2 to 3 ft.	5 lb.	..	4 to 5	
Cow Cane	Cattle food	Sept. Oct. and in Mar.	..	5 0	1 6	5,800 sets	..	7 to 8	
Cowpea	Hay or green manure	Aug. to Feb.	Sept. to Jan.	3 0	0 8	9 to 10 lb.	15 lb.	4 to 4½	
Cucumber	Market sale	July to Jan.	Aug. to Dec.	4 0	2 0	1 lb.	..	3	
Egg Plant	ditto	July to Oct.	Aug. to Oct.	3 0	1 6	..	1 oz. for 1,000 plants	6	
Garlic	ditto	Mar. to May	..	1 6	4 to 6 in.	..	..	6	
Ginger	ditto	Aug. to Nov.	..	3 0	1 0	5 to 6 cwt.	..	9 to 10	
GRASSES— Elephant	Green fodder, before the stems harden	Jan. to Mar. Aug. to Oct.	..	5 0	2 6	3,432 cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable. (Also propagated from seed.)
Paspalum	Pasture	Aug. to Dec. Jan. to Mar.	..	..	..	..	8 to 10 lb.	4 to 6	Is established more readily in the wet season, Jan. to Mar.
Prairie	ditto	Mar. to Apr.	..	..	..	..	1½ bushel	4 to 5	Only suitable for localities favoured with winter rains.
Rhodes	ditto	Aug. to Dec.	..	..	..	..	4 to 5 lb.	4 to 6	Seed germinates readily in the wet season, Jan. to Mar., and in cloudy weather.
Kohl Rabi	Market sale	Mar. to May	..	2 6	1 6	2 lb.	..	3 to 4	
Leek	Domestic use	Mar. to May	..	2 6	0 6	2 lb.	..	6 to 8	
Lettuce	Market sale	Mar. to Sept.	..	2 0	0 9	½ lb.	..	3	
Linseed (Flax)	Seed	Apr. to June	..	Drilled	..	25 to 30 lb.	..	4½ to 5	
Lucerne	Hay and green stuff	Apr. to June	..	Drilled	..	12 to 14 lb.	16 to 20 lb.	Perennial	
Maize	Grain and silage	Aug. to Jan.	Sept. to Dec.	4 0	1 3	8 to 10 lb.	..	4 to 5	For silage in forest country and in freshly cleared scrub lands, 10 to 15 lb. of seed per acre.
Mangel and Sugar Beet	Stock food	Mar. to June and in Aug.	Sept. to Oct.	2 6	1 6	5 to 7 lb.	..	6 to 7	

Marrow, Vegetable ..	Market sale	July to Mar.	Sept. to Jan.	4 to 8 ft.	3 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Rock ..	ditto	July to Sept.	Sept. to Oct.	4 to 6 ft.	2 0	1 lb. ..	..	3	Distance apart and time of maturing according to variety.
Melon, Water ..	ditto	July to Oct.	Sept. to Oct.	4 to 6 ft.	2 0	2 lb. ..	..	3 to 4	
Millet, Foxtail varieties, these include the so-called Giant Panicum	Hay and silage	Aug. to Jan.	Sept to Dec.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain and green fodder ..	Aug. to Feb.	Sept. to Jan.	Drilled	..	7 to 8 lb. ..	..	1½ to 2	
Oats	Hay and green stuff	Apr. to June	Apr. to June	Drilled	..	1¼ bushel ..	1½ to 2 bus.	4 to 5	
Onion	Market sale	Apr. to June	Apr. to June	1 0	0 4	4 lb. ..	..	6	
Panicum (White) and Japanese Millet	Silage, hay, and green stuff ..	Aug. to Feb.	Aug. to Feb.	Drilled	..	14 to 16 lb.	..	2	Should be cut for hay before seed forms.
Parsley	Market sale	Nearly all seasons	Nearly all seasons	2 6	..	1 lb. ..	..	2½ to 3½	
Parsnip	ditto	Mar. to Apr.	Mar. to Apr.	2 0	0 6	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Mar. to June	Apr. to June	2 0	..	½ to ¾ bus.	..	4 to 5	Invariably sown with a cereal, half bushel field pea, 1 bushel wheat, &c.
Pea, Garden	Market sale	Mar. to June	Apr. to June	2 0	..	1½ bushel ..	..	3½ to 4	Period of growth according to variety.
Peanut	ditto	Aug. to Nov.	Sept. to Nov.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	July and Feb.	Aug. and Feb.	3 0	1 0	8 cwt. ..	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Dec.	Sept. to Nov.	3 to 4 ft.	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Market sale and stock food ..	July to Nov.	Sept. to Nov.	8 to 10ft.	4 0	2 lb. ..	..	5 to 6	Distance apart and period of growth varies according to variety.
Radish	Market sale	All seasons ..	All seasons ..	1 0	0 3	10 to 12 lb.	..	1½	
Rape	Fodder and green manuring ..	Mar. to June	..	Drilled	..	3 to 4 lb. ..	6 to 8 lb. ..	4 to 5	Can be grazed off in 6 to 8 weeks. Should be sown with 1 lb. mustard to every 5 or 6 lb. or rape seed to prevent bloat.
Rhubarb	Market sale	Aug. to Sept.	..	4 0	4 0	Roots ..	..	2	
Rice, Upland ..	Grain or hay	Oct. to Dec.	..	Drilled	..	20 lb. ..	..	4 to 5	
Rosella	Market sale	Aug. to Oct.	..	4 0	3 0	..	..	3 to 4	
Rye	Fodder	Mar. to June	..	Drilled	..	¾ bushel ..	..	3 to 5	
Shallot	Market sale	All seasons ..	All seasons ..	1 6	0 6	..	..	..	Propagated by division of the bulbs.
Sorghum, Feed ..	Fodder and silage	Aug. to Feb.	Sept. to Dec.	3 6	0 8	4 to 5 lb. ..	..	3 to 4	Period of growth varies according to variety.

CENTRAL DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	When to Sow or Plant. Tableland and Inland Districts.	How Sown or Planted. Distance Rows Apart.	How Sown or Planted. Distance between Plants.	How Sown or Planted. Quantity Seed per Acre if Drilled.	How Sown or Planted. Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
				Ft. In.	Ft. In.				
Sorghum, Grain	Grain	Aug. to Feb.	Sept. to Dec.	3 6	0 8	4 lb. ..	..	4	Period of maturing according to variety.
Soudan Grass ..	Hay or silage	Aug. to Jan.	Sept. to Dec.	2 6	..	3 to 4 lb. ..	..	2 to 3	On clean land drills may be 14 in. apart, 8 to 9 lb. of seed being required.
Soy Beans	Grain	Aug. to Jan.	..	2 6	0 8	10 lb. ..	..	3 to 4	
Squash	..	..	..	..	..	*See* Marrows and Pumpkins.			
Sunflower	Grain	Aug. to Nov.	Sept. to Nov.	4 0	1 6	6 lb. ..	..	4 to 5	
Swede	Market sale and stock food ..	Mar. to June	..	2 0	1 0	2 to 3 lb. ..	..	3 to 4	
Sweet Corn	Market sale	Aug. to Jan.	Sept. to Jan.	3 to 4 ft.	1 0	8 to 10 lb.	..	3	Should be planted when the flowering season will not coincide with that of ordinary maize planted alongside.
Tares	Fodder or green manure ..	Mar. to June	..	Drilled	..	1½ bushel ..	½ bushel with 1 bushel cereals	4	
Tobacco	Leaf	Oct. to Jan.	Oct. to Feb.	4 0	1 ft. 8 in. to 2 ft.	1 oz. in seed beds	Transplanted	3 to 4	
Tomato	Market sale	All seasons ..	Aug. to Dec.	4 0	2 0	¼ lb. ..	Transplanted	3 to 4	
Turnip, Field ..	Stock food	Mar. to June	..	2 0	1 0	2 to 3 lb. ..	..	3	
Turnip, Garden ..	Market sale	Mar. to July	..	2 0	0 6	2 lb. ..	..	2 to 3	
Wheat	Hay or green fodder	Apr. to June	Apr. to June	Drilled	..	1 bushel ..	1½ bushel ..	4 to 5	For costal districts, only rust-resisting hay wheats suitable.

NOTES ON NORTHERN SEED TABLES.

The Northern districts vary greatly in their rainfall; also in the quantities that fall in each month. Thus, on the coastal strip Mackay and Proserpine enjoy a greater and better distributed rainfall than Bowen, the lower Burdekin, and Townsville; while from Ingham through to Cairns much the heaviest rainfall in the State is experienced. Similarly, on the Tablelands certain areas, such as Ravenshoe, Millaa Millaa, and along the watershed of the Johnstone and Russell Rivers and near the crest of the coastal range, a much heavier and better distributed rainfall obtains than a little further back.

The inland districts are not so variable as the coastal areas in their periods and quantity of rainfall.

The compilation of the present table must be looked at as a general guide and sowings made with regard to the season generally experienced in a particular locality. Generally, crops are best planted at the commencement of the monsoonal rains or wet season, starting usually in November or December. Other plantings are made towards the close of the wet season or when extra heavy rains will not cause injury to the growing crop. When about to plant, growers should consider the month the crop is likely to be harvested and arrange accordingly.

In districts of heavy rainfall many root crops, even on well-drained land, are liable to rot out. In potato planting on the Tablelands and inland it is advisable to plant before the wet season commences. The tubers will make a certain amount of root-growth, and shoots will appear on the surface in a short time after the first shower. Growth is then rapid, and when the heavier rains fall the foliage can better cope with excess moisture. The crop planted before the wet season begins always gives a heavier yield and better tubers than one planted after it.

On the Tablelands another planting can be made in February or March. Seed grown from this crop can be held for planting the main crop in October.

It is well to note that whole sets are always preferable in North Queensland to cut tubers.

In the inland districts where irrigation is practised the planting season in many instances can be extended, but due regard must be held of the likelihood of frosts.

NORTHERN AND TABLELAND DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	Tableland Districts.	Inland Districts.	How Sown or Planted. Distance Rows Apart. Ft. In.	Distance between Plants. Ft. In.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
Arrowroot	Farina and pig food	Aug. to Nov.	Aug. to Jan.	Oct. to Jan.	5 0	3 6	2,000-2,500 sets	..	8 to 10	Fresh land should be planted each year.
Artichoke (Jerusalem)	Stock food	July to Aug.	July to Dec.	July to Dec.	3 6	1 6	4 to 5 cwt.	..	4 to 5	Difficult to store; will keep better in the soil.
Asparagus	Domestic use	..	Sept.	..	4 0	1 6	7,260 roots	..	..	Suited only to the Tablelands and comparatively cooler districts.
Barley, Cape and Skinless	Green feed	Mar. to June	Feb. to June	Feb. to Apr.	..	..	1 bushel	1½ bushel	3	
Beans, French	Market sale	Apr. to Aug.	Aug. to Apr.	Feb. to Aug.	2 0	0 6	1 qt. to 100 ft. of drill	..	2½ to 3	
Beans, Lima	ditto	Mar. to Apr.	Dec. to Jan.	Nov. to Jan.	4 0	1 3	26 lb.	..	4 to 5	Only advisable as a field crop where fine weather can be depended on for harvesting.
Beet, Silver or Spinach	Stock food	Mar. to Aug.	Feb. to Sept.	Feb. to July	2 6	..	4 to 5 lb.	..	3	
Beetroot	Domestic use	Mar. to Aug.	Feb. to Sept.	Feb. to July	2 6	0 9	4 lb.	..	3	
Broom Millet	Brushware	Feb. to Mar.	Dec. to Feb.	Dec. to Feb.	3 4	0 9	4 to 5 lb.	..	4	
Buckwheat	Fodder, grain, and green manure	..	Dec. to Apr.	Dec. to Apr.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	
Cabbage	Market sale	Feb. to July	Jan. to Aug.	Jan. to Aug.	2 6 to 3 0	2 0	1 lb.	..	4	
Capsicum	Domestic use	Apr. to Oct.	Aug. to Oct.	Aug. to Oct.	3 0	2 0	1 lb.	..	4 to 5	Where districts are free from frost these may be planted all the year round.
Carrots, Field	Stock food	Apr. to Sep.	Feb. to Sept.	Feb. to Apr.	2 0	..	3 to 4 lb.	..	4 to 5	
Carrots, Garden	Market sale	Feb. to Oct.	Feb. to Oct.	Feb. to Oct.	1 6	..	4 lb.	..	4	

Cassava (Tapioca) ..	Starch, or pig food ..	July to May	Sept. to Jan.	..	5 0	2 0	4,356 cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	April to May	Jan. to May	Jan. to May	3 0	2 6	1 lb. ..	..	5 to 6	
Celery	Domestic use	..	Jan. to Mar.	..	4 0	0 6	4 oz. ..	..	5 to 6	
Chocos	Market sale	July to Oct.	Aug. to April	Aug. to Apr.	Trellis	6 0	..	..	4 to 5	
Cotton	Fibre	Feb. to July	Sept. to Jan.	Sept. to Jan.	4 0	2 0 to 3 0	5 to 6 lb. ..	..	4 to 5	
Cow Cane	Fodder	Oct. to May	Oct. to May	Oct. to Apr.	5 0	2 0	..	4,356 sets ..	7 to 8	
Cowpea	Fodder and green manure	Aug. to May	Sept. to Feb.	Nov. to Feb.	3 0	..	10 lb. ..	15 to 20 lb.	4½	
Cucumber	Market sale	Nearly all seasons	Nearly all seasons	..	5 0	2 0	1 lb. ..	..	3	Where districts are free from frosts these can be planted all the year round.
Egg Plant	Domestic use	Mar. to July	Nov. to Feb.	Nov. to Feb.	3 0	3 0	1 oz. for 1,000 plants	..	6	
Garlic	Market sale	Mar. to May	Aug. to Sept.	..	1 6	0 6	..	..	6	
Ginger	ditto	Aug. to Nov.	Oct. to Jan.	Oct. to Jan.	3 0	1 0 to 1 6	5 to 6 cwt.	..	10	
GRASSES—										
Elephant	Green fodder before the stems harden	Aug. to Oct.	Aug. to Oct.	..	5 0	2 6	3,432 cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable (also propagated from seed).
Panicum muticum	ditto	Aug. to May	Aug. to May	..	6 0	6 0	Rootlets ..	..	4 to 5	
Paspalum	Pasture..	Early rains ..	Early rains ..	Early rains ..	..	..	..	8 to 10 lb.		
Prairie	ditto	..	Mar. to Apr.	..	..	..	..	30 to 40 lb.	4 to 5	
Rhodes	ditto	Early rains ..	Early rains or mid wet season	Early rains ..	..	..	..	4 to 5 lb. ..	4 to 6	Sow in rainy season.
HERBS—										
Lavender	Perfume	Mar. ..	Aug. to Sept.	..	4 0	2 0	..	..	..	Propagated from seed or by division of rootlets.
Marjoram	..	..	Aug. to Sept.	..	2 6	0 6	..	..	..	3 months from rootlets.
Mint	..	Aug. ..	Aug. to Sept.	..	..	..	..	..	..	
Sage	..	..	Aug. to Sept.	..	2 6	0 9	..	..	..	3 months from rootlets.
Thyme	..	..	Aug. to Sept.	..	2 6	0 6	..	..	..	3 months from rootlets.
Kohl Rabi	Market sale	Mar. to Apr.	Feb. to Apr.	Feb. to Apr.	2 6	1 6	2 lb. ..	..	4 to 5	
Leek	Domestic use	Mar. to May	Feb. to Apr.	Feb. to Apr.	2 0	0 6	2 lb. ..	..	..	Suited only to the cooler districts of the North. Have seen good leeks on the coast, also inland in the North.
Lettuce	Market sale	Mar. to Aug.	Mar. to Sept.	Mar. to Aug.	2 0	0 9	½ lb. ..	..	3	
Linseed (Flax) ..	Grain	..	Jan. to Feb.	..	..	..	30 lb. ..	..	5	
Lucerne	Fodder	Mar. to Apr.	Feb. to May	Feb. to May	Drilled	..	12 to 14 lb.	16 to 20 lb.	Perennial	

NORTHERN AND TABLELAND DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	Tableland Districts.	Inland Districts.	How Sown or Planted. Distance Rows Apart. Ft. In.	Distance between Plants. Ft. In.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
Maize	Grain and silage ..	Feb. to Aug.	Nov. to Jan.	Nov. to Jan.	4 0	1 6	8 to 10 lb.	..	4 to 5	
Mangel and Sugar Beet	Stock food	..	Feb. to Mar.	..	2 6	1 3	5 to 7 lb. ..	..	6 to 7	
Marrow, Vegetable ..	Market sale	Sept. to Feb.	Nov. to Feb.	..	4 to 8 ft.	3 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Rock ..	ditto	July to Feb.	Nov. to Feb.	Aug. to Feb.	4 to 6 ft.	2 0	1 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Water ..	ditto	July to Feb.	Aug. to Jan.	Aug. to Jan.	4 to 6 ft.	2 0	2 lb. ..	..	3 to 4	
Millet, Foxtail varieties, these include the so-called Giant Panicum	Fodder	Oct. to Mar.	Aug. to Mar.	Dec. to Feb.	..	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain	..	Aug. to Feb.	..	..	..	8 to 10 lb.	..	1½	No good in tropics
Oats	Green feed	May to June	Mar. to June	Feb. to Apr.	..	..	1¼ bushel ..	1½ to 2 bus.	4 to 5	
Onion	Market sale	Mar. to May	Mar. to May	Mar. to Apr.	1 0	..	4 lb. ..	..	5 to 6	
Panicum (White) and Japanese Millet	Silage, hay, and green fodder	Oct. to May	Sept. to Mar.	Oct. to Mar.	..	..	14 to 16 lb.	..	2	
Parsley	Market sale	Mar. ..	Feb. ..	Feb. ..	2 6	..	1 lb. ..	..	2½ to 3½	
Parsnip	ditto	Feb. to Apr.	Jan. to Apr.	Jan. to Apr.	2 0	0 9	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Apr. to June	Feb. to June	Mar. to Apr.	2 0	..	½ to ¾ bus.	..	4 to 5	Usually combined with a cereal fodder crop.
Pea, Garden	Market sale	Mar. to May	Feb. to June	Mar. to May	2 0	..	1½ bushel	..	4	Period of maturing according to variety.
Peanut	ditto	Nov. to Mar.	Nov. to Feb.	Nov. to Feb.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	Mar. to June	Oct. to Dec. Feb. to Mar.	Oct. to Dec. Feb. to Mar.	3 0	1 0	8 cwt. ..	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Mar.	Oct. to Feb.	Oct. to Feb.	3 to 3½ ft.	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Market sale and stock food	Mar. to Apr. and from Aug. to Nov.	Nov. to Feb.	Nov. to Feb.	6 to 8 ft.	3 to 4 ft.	2 lb. ..	..	5 to 6	Distance apart and period varies according to variety.
Radish	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 0	..	10 to 12 lb.	..	1½	

Rape	Fodder and green manure	Apr. to July	Mar. to May	Mar. to Apr.	..	..	5 to 6 lb. ..	..	4 to 5	
Rhubarb	Market sale	Aug. to Sept.	Sept. to Nov.	Sept. to Nov.	4 0	4 0	1½ lb. ..	..	4 to 5	When propagated from roots quicker returns may be expected.
Rice, Upland ..	Grain	Sept. to Apr.	Oct. to Feb.	Oct. to Jan.	Drilled	..	12 to 16 lb.	40 to 50 lb.	4 to 6	Harvest when half seed head is yellow. Stack and thresh after 6 weeks.
Rosella	Market sale	Sept. to Feb.	Oct. to Feb.	Oct. to Jan.	3 to 4 ft.	3 0	..	..	3 to 4	
Rye	Fodder	Mar. to July	Mar. to June	Mar. to May	Drilled	..	¾ to 1 bus.	..	4	
Shallot	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 6	0 6	..	..	3 to 4	
Sorghum, Feed ..	Fodder and silage ..	Nov. to May	Nov. to Mar.	Nov. to Feb.	3 6	0 8	4 to 5 lb. ..	..	3 to 4	
Sorghum, Grain ..	Grain	Nov. to May	Nov. to Mar.	Nov. to Feb.	3 6	0 8	3 to 4 lb. ..	..	4	
Soudan Grass ..	Hay or silage	Early rains ..	Early rains ..	Early rains ..	2 6	..	3 to 4 lb. ..	..	2	
Soy Beans	Grain	May to July	Sept. to Jan.	Sept. to Jan.	2 6	0 8	10 lb. ..	..	3	
Swede	Market sale	Mar. to May	Feb. to May	Feb. to Apr.	2 0	1 0	2 to 3 lb. ..	..	4 to 5	
Sweet Corn	ditto	Aug. to Jan.	Nov. to Jan.	Nov. to Jan.	3 6	1 0	8 to 10 lb.	..	3	
Tares	Fodder or green manure	Same as Field	Peas.	..	..	..	1½ bushel ..	½ bushel with 1 bushel of other grain	4	For fodder purposes it is best sown with some other form of cereal.
Tobacco	Leaf	Oct. to Jan.	Oct. to Dec.	Oct. to Dec.	4 0	1 ft. 8 in. to 2 ft.	1 oz. in seed bed	..	3 to 4	Seeds must be sown in specially prepared seed beds and transplanted during period.
Tomato	Market sale	Feb. to July	Nov. to July	Nov. to July	4 0	2 0	¼ lb. ..	..	3 to 4	
Turnip, Garden ..	ditto	Apr. to June	Feb. to May	Mar. to May	2 0	0 6	2 lb. ..	..	2 to 3	
Wheat	Hay, or green fodder ..	Mar. to June	Feb. to June	Mar. to May	Drilled	..	40 to 60 lb.	..	4 to 5	Fodder purposes only.

PLATE 48.

PRESENTATION OF STAFF AND STUDENTS OF THE AGRICULTURAL COLLEGE TO H.R.H. THE DUKE OF GLOUCESTER.

Not only once or twice, but even thrice, the Duke of Gloucester mentioned to His Excellency the Governor (Sir Leslie Wilson), how pleased and impressed he was with the work, both practical and theoretical, which, on his visit to the Q.A.H.S. and College at Gatton, on 4th December, he noted was being done for the people of Queensland.

PLATE 19.

ROYAL VISIT TO QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE, 4TH DECEMBER.

H.R.H. the Duke of Gloucester meeting Students and Staff in the College Grounds. Accompanying the Duke are the Premier (Hon. W. Forgan Smith), the Minister for Public Instruction (Hon. F. A. Cooper), and Professor J. K. Murray, Principal.

NEW HIGHWAYS IN QUEENSLAND.

THE WORK OF THE MAIN ROADS COMMISSION.

THE Thirteenth Annual Report of the Commissioner for Main Roads, Mr. J. R. Kemp, is an impressive record of rural development in Queensland. During the year considerable progress was made in extensive developmental projects in every division of the State, as indicated in Mr. Kemp's notes on his inspectional visits—an interesting feature of his report. Up to 30th June last 2,645 miles, comprising works of various types, from clearing and drainage to concrete and bitumen surfacing, had been completed; while 458 miles were under construction at that date, together with 83 miles of works to convert previously constructed roads to a higher type.

Works were undertaken in 139 Local Authority areas, and a maximum number of 3,550 men per month were employed.

In general, works are proceeding at the rate of about 1½ mile of road completed per working day. In addition to the road mileage shown above, about 9 miles of bridges have been constructed, and 3,307 feet are in hand. There are now 10,568.7 miles gazetted under the Main Roads Acts—including State Highways, 2,263.63, Main roads 7,839.14, developmental roads 292.45, and tourist roads 173.48.

It has not been possible to undertake construction on all of these roads during the year, but endeavours are being made to spread the expenditure of funds over as wide an area as possible.

Where permanent works have not been undertaken maintenance funds have been provided in order to keep the roads in a reasonably trafficable condition.

Consultations with Local Authorities are constantly taking place so as to ensure that the works of greatest urgency are first undertaken, and gradually the links are being forged together into a chain of roads extending over the length and breadth of the State.

Through the courtesy of the Commission we are able to reproduce a series of excellent illustrations, taken from the report, and which indicate the immense value of a great community service.

PLATE 50.

ROSEWOOD SHIRE.—BRISBANE-TOOWOOMBA ROAD (HOSPITAL HILL).

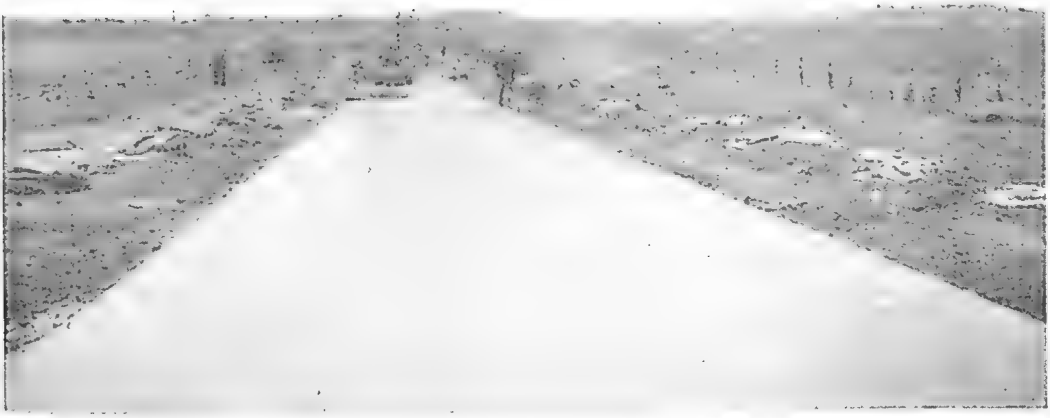


PLATE 51.
CLIFTON SHIRE.—CLIFTON-PITTSWORTH ROAD.
Cement penetration.

PLATE 52.
LIVINGSTONE SHIRE.—FARNBOROUGH-BYFIELD ROAD.
Constructed June, 1934.

PLATE 53.
COMPLETED METALLED SECTION READY FOR TRIMMING AND BITUMEN SURFACE—NORTHERN HIGHWAY (REDCLIFFE-CABOOLTURE SECTION).

PLATE 54.
NORTH COAST ROAD (REDCLIFFE-CABOOLTURE SECTION).
Finished pavement.

Plate 55.

Cambooya Shire.—Greenmount-Hirstvale Road, looking towards Toowoomba.

Plate 56.

Pioneer Shire.—Mackay-Habana Road.

Flood invert section on road serving cane-growing and dairying district north-west of Mackay.

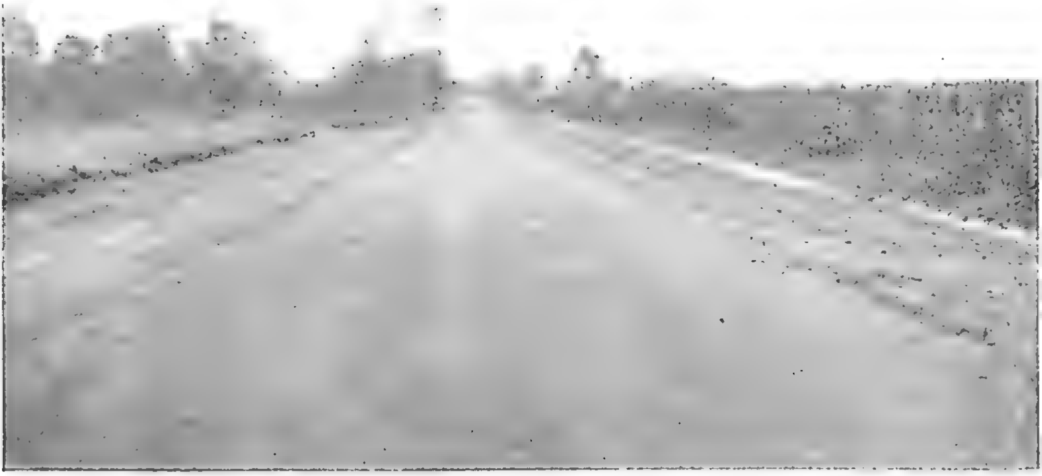


PLATE 57.
ROSELLA-HOMEBUSH ROAD.
Serving cane-growing area.

PLATE 58.
DOUGLAS SHIRE.—CAIRNS-PORT DOUGLAS ROAD.

PLATE 59.
PACIFIC HIGHWAY (MAIN SOUTH COAST ROAD).
Night visibility discs on curves.

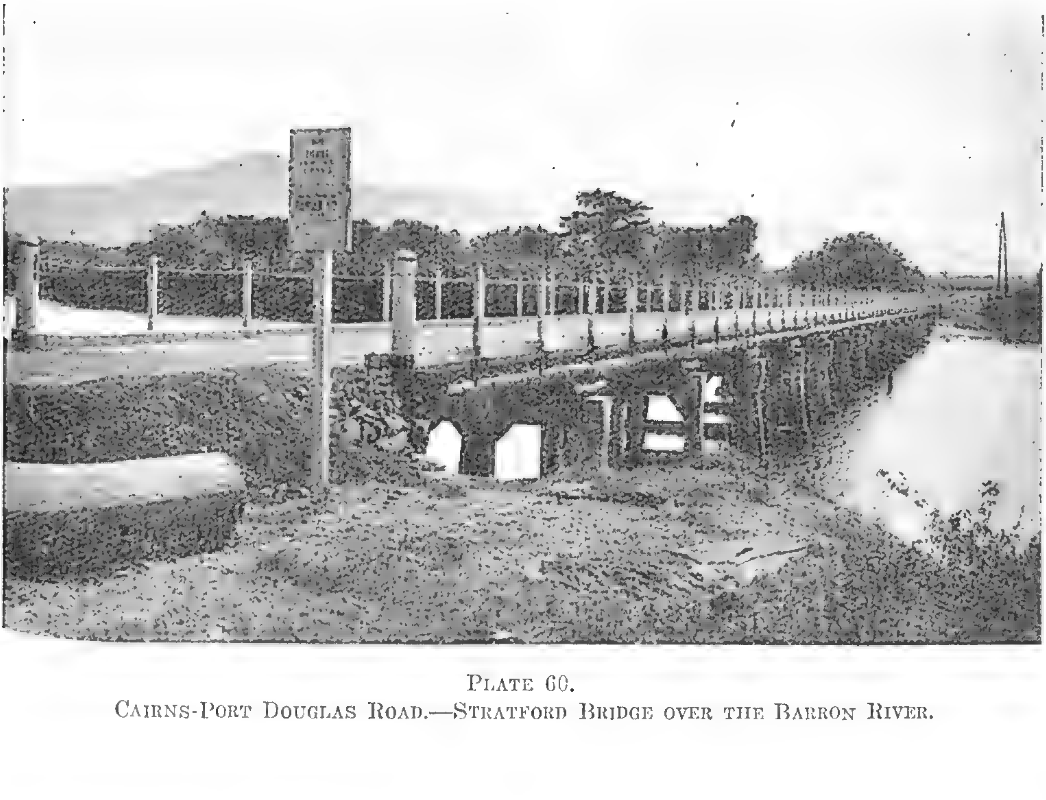


PLATE 60.
CAIRNS-PORT DOUGLAS ROAD.—STRATFORD BRIDGE OVER THE BARRON RIVER.

PLATE 61.

MIRANI SHIRE.—MARIAN-NETHERDALE ROAD-CATTLE CREEK BRIDGE EXTENSION.

Extension to existing bridge erected by Shire Council. The maintenance of the approaches was a constant source of expense to the Council.

PLATE 62.

MAROOCHY SHIRE.—MARY RIVER ROAD.

Bridge over Little Yabba Creek.

PLATE 63.
BRISBANE-TOOWOOMBA ROAD.
Rolling and smoothing after drag operations.

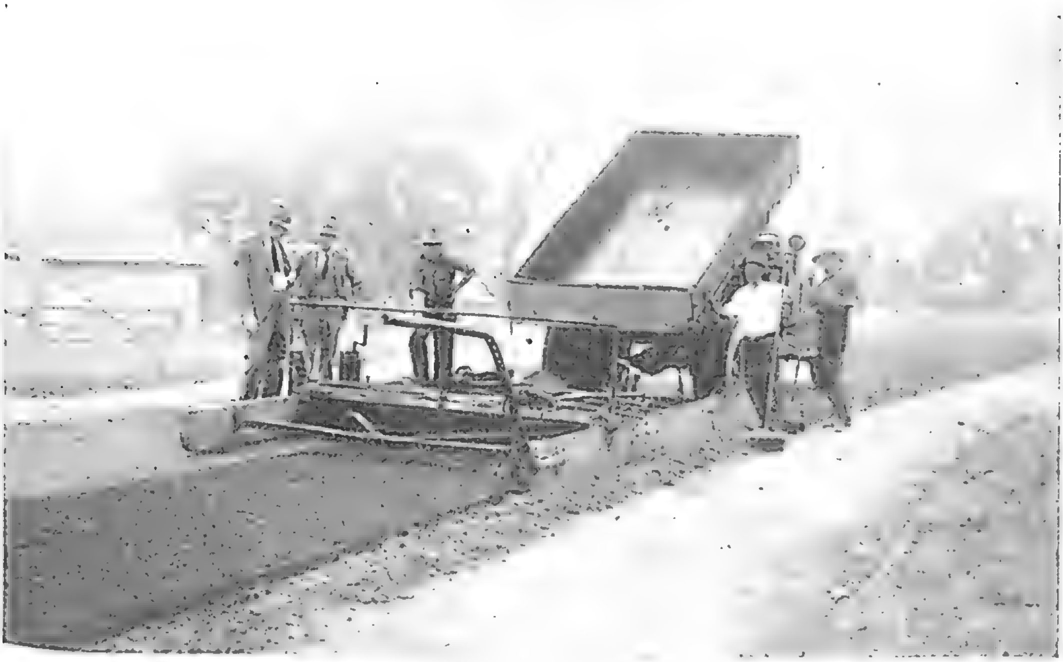


PLATE 64.
DRAG SPREADING (WITH 8 FEET DRAG) ON BRISBANE-TOOWOOMBA ROAD.
Spreading operation completed.

PLATE 65.
CRUSHING AND MIXING OPERATIONS ON BRISBANE-TOOWOOMBA ROAD.

PLATE 66.
SPRAYING TAR ON THE BUNDABERG-GIN GIN ROAD.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from 3rd January, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for January, February, and March, 1935:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 15th January, 1935—"The Place of Plant Breeding in Agriculture," by Dr. L. G. Miles, Plant Breeder.

Thursday, 17th January, 1935—"The Trend of Agricultural Economics," by Hon. Frank W. Bulcock, M.L.A., Secretary for Agriculture and Stock.

Tuesday, 22nd January, 1935—"The Problem of Youth—The Call of the Land," by J. F. F. Reid, Editor of Publications.

Thursday, 24th January, 1935—"A New Deal for the Farmer," by J. F. F. Reid, Editor of Publications.

Tuesday, 29th January, 1935—"Frost Prevention by Orchard Heating," by H. Barnes, Director of Fruit Culture.

Thursday, 31st January, 1935—"Wheat in Queensland," by H. W. Ball, Assistant Experimentalist.

Tuesday, 5th February, 1935—"The Rural Revival in Britain—What it Means to the Australian Producer," by J. F. F. Reid, Editor of Publications.

Thursday, 7th February, 1935—"Grading Cotton," by R. W. Peters, Cotton Experimentalist.

Tuesday, 12th February, 1935—"Winter Legumes and other Fodders," by C. T. White, Government Botanist.

Thursday, 14th February, 1935—"Some Notes on Our Inland Pastures," by S. L. Everist.

Tuesday, 19th February, 1935—"Management of Paspalum Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 21st February, 1935—"The Cultivation of Lucerne," by A. E. Gibson, Director of Agriculture.

Tuesday, 26th February, 1935—"The Effects of Fertilizers on the Quality of Tobacco Leaf," by W. J. Cartmill, B.Sc.

Thursday, 28th February, 1935—"Snapping Cotton," by R. W. Peters, Cotton Experimentalist.

Tuesday, 5th March, 1935—"The Activities of Sheep and Wool Branch with Special Mention of the Farmers' Wool Scheme," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 7th March, 1935—"Sheep Licks," by J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 12th March, 1935—"Winter Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 14th March, 1935—"Grape Culture," by H. Barnes, Director of Fruit Culture.

Tuesday, 19th March, 1935—"Some Remarks on Animal Nutrition," Part I., by E. H. Gurney, Agricultural Chemist.

Thursday, 21st March, 1935—"Some Remarks on Animal Nutrition," Part II., by E. H. Gurney, Agricultural Chemist.

Tuesday, 26th March, 1935—"Observations on Tobacco Fertilizer Trials," by W. J. Cartmill, B.Sc.

Thursday, 28th March, 1935—"Expanding our Export Trade," by J. F. F. Reid, Editor of Publications.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register for the Herd Book of the Australian Illawarra Shorthorn Society, Jersey Cattle Society, Friesian Cattle Society, Guernsey Cattle Society, production charts for which were compiled for the month of November, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.				
Handsome 6th of Oakvilla	T. Strain, Wondai	11,495·35	465·605	Victory of Greyleigh
Empress 13th of Sunnyside	P. Moore, Wooroolin	10,400·14	426·074	Emblem of Sunnyside
SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.				
Clonogan Mignonette	T. Strain, Wondai	10,046·41	380·483	Jerry of Cosy Camp
SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.				
Marn Patty	R. Martin, Biggenden	9,743·15	464·798	Triumph of Happy Valley
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Kalinga Roseleaf 2nd	J. A. Heading, Cloyna	7,361·81	305·576	Bruce Galvallis
Merridale Mermaid	H. D. Giles, Biggenden	6,423·05	290·022	Premier of Lanefield
SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.				
Marn Betty	R. Martin, Biggenden	7,345·25	340·208	Happy Valley Happy Lad
Lyndith Queenie 5th	S. H. Teese, Veresdale	7,999·75	278·206	Brooklyn Terrace, President
JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS). STANDARD 230 LB.				
Sunnyview Bess	J. Phillips, Wondai	13,017·16	507·425	Lovely's Commodore of Burradale
Montcairn Melba	A. E. Vohland, Aubigny	7,312·25	316·066	Viceroy of Wilga Vale
Blackland's Carnation	A. M. Johnson, Gracemere	6,909·4	264·074	Park View Limelight
Cedargrove Ita 11th	W. J. Freeman, Rosewood	6,034·5	257·670	Duke of Cedar Grove
Penrhos Beauty	A. Sandilands, Wildash	5,547·5	247·180	Rosenthal's Pendant's Prince
Mountain Home Gem 8th	M. C. Lester, Laidley Creek	6,253·01	239·876	Headlight of Greyleigh
Penrhos Plum 2nd	A. Sandilands, Wildash	5,920·5	234·712	Rosenthal Pendant's Prince

JERSEY.				
JUNIOR, 2 YEARS OLD (UNDER $2\frac{1}{2}$ YEARS), STANDARD 230 LB.				
Glenview Sunflower	F. P. Fowler & Sons, Biggenden	5,536·	327·064	Trinity Officer
Trecarne Merle IV.	D. R. Hutton, Cunningham	5,425·75	300·173	Trecarne Golden King
Glenview Choice	F. P. Fowler & Sons, Biggenden	4,821·75	283·983	Trinity Officer
Glenview Lady Lynn	F. P. Fowler & Sons, Biggenden	4,449·5	282·212	Carlyle Larkspur 2nd Empire
Glenview Viscountess	F. P. Fowler & Sons, Biggenden	3,897·45	239·019	Carlyle Larkspur 2nd Empire
FRIESIAN.				
SENIOR, 2 YEARS OLD (OVER $2\frac{1}{2}$ YEARS), STANDARD 250 LB.				
Oakland Maria Pearl	W, Richters, Tingoora	9,382·32	332·143	Pied Rock
GUERNSEY.				
JUNIOR, 2 YEARS (UNDER $2\frac{1}{2}$ YEARS), STANDARD 230 LB.				
Willow Brae Sequel	H. Blanck, Eudlo	4,867·8	276·785	Linwood Lone Star

Crown Land for Selection.

SHEEP COUNTRY.

BLACKALL DISTRICT.

LORNE AND TERRICK TERRICK RESUMPTIONS.

67,316 acres.

(To be open at the Land Office, Blackall, on Thursday, 7th February, 1935.)

Comprising portion 5, parish of Berriedale, situated about 30 miles south of Blackall, and portions 5, parish of Lauriston, and 2, parish of Maindample, situated about 25 miles south-west of Blackall.

The country comprises open and well-shaded downs, well grassed with Mitchell, blue, and Flinders grasses, and is watered by bores and tanks.

The land is good sheep country, suitable for woolgrowing, breeding, and fattening.

Annual rent is 4d. per acre for the first seven years; also

LONGREACH DISTRICT.

PORTLAND DOWNS RESUMPTION.

44,462 acres.

(To be open at the Land Office, Longreach, on Thursday, 21st February, 1935.)

Comprising portions 1, parish of Seaford, and 4, parish of Tylden, situated about 25 miles and 30 miles north-east from Isisford.

Portion 1, parish of Seaford, is watered by the Barcoo River and by a tank and bore drain, and portion 4, parish of Tylden, by creeks, dams, and a bore drain.

The country is partly open downs, timbered with gidyea and boree, and grassed with Mitchell, blue, Flinders, and other grasses.

The land is good sheep country, suitable for woolgrowing, breeding, and fattening.

The annual rent for the first seven years is 3½d. per acre for portion 1, and 2¾d. per acre for portion 4.

Portion 4, parish of Tylden, will be subject to the condition that 2,500 acres shall be ringbarked within five years.

The term of lease in each case is twenty-eight years. During the first three years each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep, and must be enclosed with a rabbit and marsupial-proof fence.

Free lithographs and full particulars obtainable from the Land Agents, Blackall and Longreach, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence Bureaux, Sydney, and Melbourne.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

"Chinese Cabbage."

J.W. (Capella)—

The specimens have been determined as *Brassica juncea,* a common weed in cultivations. In some parts of the south coast of Queensland it is known locally as Chinese Cabbage. It probably has some nutritive value as a fodder, but in the case of milking cows it may possibly impart a disagreeable flavour to the milk.

Winter Sweet or "Bushman's Poison."

E.J. (Auchenflower)—

The specimen forwarded is *Acocanthera spectabilis,* better known to nurserymen as *Toxicophlœa spectabilis,* the Winter Sweet or Bushman's Poison. It is a native of South Africa, and much cultivated as an ornamental shrub. A list of poisonous plants in the Brisbane Gardens was published recently, and a friend in Melbourne said he noticed the list and was surprised to see *Acocanthera* in it. Mr. Cronin, the Director of the Melbourne Botanic Gardens, had informed him that both himself and his children had eaten the fruits of this tree quite freely without any ill-effects following. The plant, however, is undoubtedly a poisonous one. We have never heard of persons being actually poisoned in the way you mention through handling the leaves and flowers, although the flowers are commonly used by nurserymen particularly for making up wreaths, crosses, &c. We were very interested to have your note on the plant. As you know, with these irritant plant poisons some people are much more sensitive than others.

Tick Trefoil. Barbed Wire Grass. Pimpernel. Vicia Sativa.

W.C. (Buderim Mountain)—

1. *Desmodium triflorum,* a species of Tick Trefoil, quite a valuable legume in the pasture. It is eaten by stock, the only objection to it being that it grows rather too close to the ground to give animals much of a bite. The name Tick Trefoil refers to the small pods being broken off in small pieces, which adhere to clothing, to the hairs of animals, &c., by means of minute hooked hairs or bristles.
2. *Cymbopogon refractus,* Barbed Wire Grass. The local name is given on account of the peculiar way the spikelets bend back. Not of much value as a fodder.
3. *Anagallis arvensis,* Pimpernel, a common farm weed in Queensland. It is poisonous to stock but rarely eaten by them in sufficient quantities to cause trouble. Several years ago we received from your district seeds taken from the stomach of a cow supposed to have died from plant poisoning.
4. *Vicia sativa* var. *segetalis,* a variety of the common Vetch; quite a good fodder. It often comes up spontaneously in cultivation paddocks, along railway cuttings, roadsides, &c.

Brazillian Clover.

E.W. (Roma)—

Your specimen represents *Jacksonia brasiliensis,* commonly called Mexican or Brazilian Clover, although the plant does not belong to the clover family nor is it even closely related to the clovers and trefoils. Although it has been highly spoken of as a fodder at odd times, our experience with it in Queensland is that stock rarely take to it. Most of our experience with it is as a weed on coastal orchards where it is extremely abundant, particularly in some of the pineapple plantations on the North Coast Line. We do not think there is much to fear from it in the general pasture, as it is mostly a weed of cultivation or any place where the ground has been disturbed. It is possible that in the drier climate of the Maranoa district the plant might be more palatable, particularly in the stages when it is drying off somewhat. Very often cattle refuse this type of plant when it is green and luxuriant and eat it readily enough in the form of hay or when it is drying off naturally.

Red Leg or Bitter Blue Grass.

J.G. (Ridgelands)—

Your specimen represents the Red Leg or Bitter Blue Grass (*Bothriochloa decipiens*), a native grass very abundant in many localities. As the better grasses are eaten out this grass persists, and in some parts of coastal Queensland and in the Lockyer and Fassifern districts it becomes the dominating grass in the native pasture. So far as we have experienced stock do not take readily to it, and where possible it is advisable to try and introduce better grasses to smother it out.

Cape Cotton.

J.D.F. (Jimbour)—

The specimen is *Gomphocarpus fruiticosus*, the Cape Cotton, also called Wild Cotton or Balloon Cotton. It belongs to a poisonous family and we believe is poisonous to stock, but they rarely eat it in sufficient quantities to cause trouble. It is a native of South Africa but has been naturalised in Queensland and New South Wales for many years now. In this State it is most abundant on scrub coastal farms, but of recent years it seems to be spreading inland, particularly on cleared scrub country. If allowed to spread it certainly does smother country very rapidly and we have seen it on the coast as thick as Scotch Thistle; sometimes is on the Downs and in the Maranoa district.

Wandoan Plants Identified.

DON (Wandoan)—

1. *Rhagodia nutans* (?). Specimen very decomposed, therefore determination rather doubtful. It is, however, one of the Saltbush family and represents one of the green species either as determined or an allied one. They are quite good fodders, relished by stock particularly when made into hay or when drying off somewhat. The only disadvantage is that they are apt to taint the milk of dairy cows, giving it a weedy or almost fishy flavour.
2. *Zygophyllum apiculatum*, Gall Weed or Twin leaf. I have never seen stock eat this plant, though it is not known definitely to contain any poisonous principles. It is exceedingly abundant in much of the ring-barked country on the Western Downs and parts of the Maranoa.
3. *Chenopodium album*, Fat Hen.
4. *Tetragonia expansa*, New Zealand Spinach. The young shoots and leaves of this plant are said to make quite a good spinach. We cannot say we have known stock take to it to any great extent. They prefer many of these succulent plants when they are drying off somewhat rather than when they are green and luxuriant.
5. This specimen is too decomposed for identification.
6. *Panicum queenslandicum*, a native Panic Grass. Most of the native Panic Grasses are quite good fodders.
7. *Eriochloa* sp. One of the so-called Early Spring Grasses. Excellent fodder and worth encouraging.
8. *Solanum aviculare*, Kangaroo Apple. A fairly common weed in parts of Queensland, both on the coast and for some little distance inland. The berries are poisonous. The young plants as they come up after a burn have been accused, and I think on good evidence, of poisoning sheep, though normally speaking stock avoid the plant.
9. *Cassia laevigata*, commonly called Arsenic Bush, though this name is rather misleading as the leaves when eaten are likely to purge stock but not to have any other effect. We think it would be just as well, if you only have a few bushes on your place, to destroy them.

Knot Grass or Knot Weed.

L. McG. (Bungeworgorai)—

Your specimen represents *Polygonum aviculare*, Knot Grass or Knot Weed, a plant widely spread as a weed of cultivation over the warm temperate regions of the world. It is quite a common plant on some of the farms of the Darling Downs. We have never heard of it causing harm to stock in any way, although it is possible that if the long wiry stems were eaten by them impaction would follow.

General Notes.

Staff Changes and Appointments.

Mr. R. W. Bambrick, Inspector under the Stock, Slaughtering, and Dairy Produce Acts, has been transferred from Toowoomba to Hughenden.

Mr. G. B. Gallwey, Inspector of Accounts under the Dairy Produce Acts, Department of Agriculture and Stock, has been appointed also Inspector of Accounts under the Pig Industry Act.

The following additional appointments have been granted to Inspectors in the Department of Agriculture and Stock:—

Messrs. S. B. Myles, Stock Inspector, Wyalla; J. Wyvill, Stock Inspector, Nanango; A. F. H. D. Singh, Stock Inspector, Wondai; T. Douglas, Stock Inspector, Kingaroy; C. E. Ellis, Stock Inspector, Killarney; and R. T. Cridland, Slaughtering Inspector, Rockhampton; have been appointed also Inspectors under the Dairy Produce Acts.

Mr. M. D. O'Donnell, Dairy Inspector, Gympie, has been appointed also an Inspector under the Diseases in Stock Acts.

Mr. E. W. Ladewig, Dairy Inspector, Murgon, has been appointed also an Inspector under the Slaughtering and Diseases in Stock Acts.

Mr. J. V. Munck has been appointed Canegrowers' Representative on the Farleigh Local Sugar Cane Prices Board, vice Mr. P. Kirwan, resigned.

The following have been appointed Honorary Rangers under the Animals and Birds Acts in the Clermont district:—Messrs. S. C. Fox, Manager of Batheaston Station; J. S. McCormack, Manager, Diamond Downs; K. McLean, Manager, Peak Downs; H. C. S. Griffin, Manager, Wolfang Station; H. A. Rickertt, Manager, Langton Downs; R. H. Griffin, Manager, Currajong Station; J. F. McKenzie, Manager, Moray Downs; R. O. Spenceley, Manager, Kilcummin Station; W. R. Tindale, Manager, Monteagle Station; H. K. Goodwin, Manager, Banchory Station; R. A. Mathieson, Manager, Logan Downs; and F. W. Kettle, Manager, Prairie Station.

Mr. C. R. Mulhearn, B.V.Sc., Veterinary Officer to the Division of Economic Entomology of the Council for Scientific and Industrial Research, Canberra, has been appointed a Government Veterinary Surgeon, Department of Agriculture and Stock, and will be attached to the staff of the Animal Health Station at Yeerongpilly.

The following transfers of officers of the Department of Agriculture and Stock have been approved:—

Mr. J. W. Winlaw, Stock, Slaughtering, and Dairy Inspector, from Brisbane to Boonah;

Mr. J. R. D. Munro, Dairy Inspector, from Warwick to Clifton; and

Mr. L. Moriarty, Dairy Inspector, from Clifton to Warwick.

Mr. A. M. Taylor, Clerk of Petty Sessions, Ayr, has been appointed Chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards in lieu of Mr. T. R. Kennedy, Police Magistrate, Bowen.

Constable F. Mawn, of Mount Surprise, has been appointed also an Inspector of Slaughter-houses.

Mr. R. A. F. Ives, of Upper Mudgeeraba, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

The following have been appointed Honorary Inspectors under the Diseases in Plants Acts:—

Messrs. G. J. McGee (Eulama), D. C. Haylock (Cootharaba), A. Braithwaite (Chinaman's Creek), W. R. Hayter (Ironstone Creek), and J. H. Lane (Middle and Skyring's Creeks).

Pure Tobacco Seed Districts Declared.

A Tobacco Pure Seed district embracing Marmor and Bajool, near Rockhampton, was declared by Order in Council of the 20th September last. It has since been recommended that an additional area be included, and an Order in Council under the Tobacco Industry Protection Act has been issued altering the boundaries of this district. The Archer district is now included.

Rural Topics.

Castration of Pigs.

There is no more important work associated with the raising and marketing of pork and bacon pigs than that of having animals of the right type in the primest of condition at the time they go forward to the factory or saleyard. With the knowledge that this simple surgical practice is essential in preparing male pigs for the meat market, and with the further knowledge gained from experience and observation that many beginners as well as many older farmers do not know how to perform correctly the operation of castration, the Senior Instructor in Pig Raising, Mr. E. J. Shelton, has dealt fully with the subject-matter and has presented detailed instructions in convenient form and in every-day language in a Departmental Pamphlet, "Castration of Pigs," now obtainable free of cost on application to the Department of Agriculture and Stock, Brisbane.

Summer Comfort for Pigs.

During the summer months the provision of shade for pigs is very essential. The ordinary sty, especially if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If no trees are present a wooden shed will answer the purpose.

Another important aid to the health and comfort of swine is the provision of a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling himself, and if the pig-yards have a frontage to a stream, well and good, though there is an objection to pigs wallowing in a stream, in so far that infection may be carried down from diseased pigs higher up the stream, and as a result contagion spread over a wide area. Unfortunately, the hog wallow usually seen on the pig farm consists of a filthy puddle-hole, into which drains all the excrement from the yards, and in the foul mud of this, the only wet spot available, the pigs are compelled to seek relief. If there is infection of any kind in the yard it is to be found in just this place.

Such wallows should be drained and filled in, and if there is no naturally clean place for the pigs to lie in, a concrete or similar bath should be built. This can then be kept clean, and the liability to infection from contagious disease will be diminished.

Waster—Or High Producer? Only the Tester can Tell.

All experience goes to show that it is futile to speak of the productive ability of a dairy cow except as proven by her test. When herd-recording was commenced it was contended by many farmers that they could tell what their cows were doing without putting them under record, merely by relying on outward appearances, such as body formation, the size of the milk veins, and size and shape of the escutcheon. There were those who knew the quality of milk by its colour, and others who could tell by its feel. The systems of judging were many and diverse. To settle the matter definitely for them it was arranged that when the recorders went their first rounds, members were to pick out on their own judgment the three best and three worst cows in their herds, and at the conclusion of the year's testing their selections were to be compared with the actual returns obtained as shown by the Babcock test.

Each member put his pick down on paper and handed it over to the tester. The results convinced all concerned that they were wrong in their contentions; the Babcock won all along the line. In not one case was an owner able to pick out without error his worst and best cows.

The majority were right out in their reckoning. In some cases those picked out as the worst proved to be among the highest yielders. One farmer thought so much of a cow that he had paid a fancy price for her and brought her at considerable expense some 200 miles to his farm on the Tweed. He thought her the best cow on that river, and certainly by appearance she was a top-notcher. She was first recorded six weeks after calving and gave one half-pound of butter for the twenty-four hours' milkings, the test being 1.9 per cent. fat. She was in good health and condition and feed was plentiful. The following month she just exceeded a quarter of a pound of butter for the day. The third month's test showed the day's butter production to be under a quarter of a pound. She gave a fair quantity of milk, but there was too little fat in it. She was soon culled out.—A. and P. Notes, N.S.W. Department of Agriculture.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

HOLIDAY TRAVELLING.

TRAVELLING with a baby and several small children is no holiday for their mother. Unless she plans everything carefully beforehand a long train journey may end with an exhausted mother and a handful of cross, tired, over-fed children, who will be sick for the next few days. Perhaps a little advice at this season of the year may be helpful.

Food.

It is most important that this should be carefully considered beforehand. The breast-fed baby, who has been properly managed, should give no trouble at all. But it is not so with the bottle-fed infant. We have seen many who have been seriously upset by milk which has gone bad in the train, especially in hot weather. It is true that there are ways of carrying the baby's milk safely; but these require so much care and understanding, and the consequences of any mistake may be so serious, that we cannot advise them. Nor can we advise the mother on a journey to buy milk at the railway stations. Much the safest plan is to carry a supply of good dried milk (Glaxo or Lactogen), not, of course, dried skimmed milk. Boiling water is always procurable, and it may also be carried in vacuum flasks, so that it is always possible to scald the bottles and teats and to make up the feeds for each meal. Any milk left after a feed should be thrown out at once, never left in the bottle. It is well to carry more than one bottle and teat. These should be wrapped in clean, boiled, butter muslin and carefully packed in a tin. Though the baby may not be used to dried milk, it will do him no harm, provided it is not made too strong. It will be wise to make it up rather weaker than advised on the tin. At the end of the journey, when good fresh milk is procurable, he will soon make up for having been on a rather weak mixture for one or two days.

For the toddler avoid bought foods, cakes, and sweets, which may do him much harm, especially as the novelty and excitement will very probably have weakened his digestion. Remember that a day of rather short rations will do him no harm, but a day of over-feeding may go a long way to spoil his holiday and your own, too. Carry your own provisions. Pack a tin with some slices of baked bread and oatcake, which may be ready buttered, and some sandwiches, preferably of brown bread. These may contain lettuce or silver beet, sliced tomatoes, egg (either sliced or scrambled), or soft cheese spread on butter, or marmite. Add a few dates and raisins, apples, and oranges, and you have all the solid food necessary. He may drink dried milk dissolved in hot water, like his baby brother, or you may carry one or two lemons with a small packet of sugar, which will make a drink he will surely relish. Let him have his little picnics at the right times, but don't try to keep him

quiet by feeding him all the time. You won't succeed; it will only make him cross and irritable, miserable himself and a torment to others; but let him have a drink of water when he wants it.

Amusement.

Most children will be interested in looking out of the window until they are tired, but don't let them tumble out. It may be well to carry a few simple toys and picture-books and writing-pad and a pencil.

Clothing.

You won't need to carry much wraps in the summer, but a light rug and cushion will be useful. For the baby have a plentiful supply of napkins, and some old newspapers or a mackintosh bag for the wet napkins.

Rest and Sleep.

These are important if over-fatigue and fretfulness are to be avoided. A dress-basket is most useful for a young baby. Properly managed he will sleep or lie awake in this quite contented, and much happier than if constantly nursed in the arms of an over-heated and exhausted mother.

If you have trained your children well you will reap your reward when travelling. How sad it is to see children in the train scrambling over everything, eating an endless supply of cakes and sweets, grubby and tired, ignoring their mother's efforts at control, and finally fretful and crying from sheer exhaustion and discomfort.

IN THE FARM KITCHEN.

The Orange—Food and Medicine.

"The apple is a most delightful fruit," said Professor V. H. Mottram, Professor of Physiology of the University of London, and an authority on foods, "yet it is only a sweetmeat and is negligible as nourishment or as a medicine. On the other hand, the orange is most valuable as nourishment, and medicinally. It is anti-scorbutic, and rich in the vitamin contained in sunlight. It also has calcium, which is essential to bone-building. Recent experiments indicate that oranges are nearly the equal of milk in nourishment."

Food Value of Bananas.

When it is considered that the banana is an article of diet in every country of the world, and that the inhabitants of some portions of the globe subsist on it almost entirely, it is strange to find some people under the impression that bananas should be eaten sparingly and only by people with good digestion, runs the introduction to the banana recipe booklet issued by the Commonwealth Banana Committee.

It is true that the banana, eaten in an *unripe* state, will, in common with all fruits, cause intestinal disturbance to a greater or less degree. The *ripe banana*, however, is not only a fruit of remarkably high food value, but is amazingly easy to digest. It can be eaten with safety and relish by everyone from infancy onwards.

No fruit compares with the ripe banana in food values; no fruit approaches it in regard to digestibility and easy assimilation; no fruit and very few foodstuffs approach it in regard to value for money expended. Writing of the banana, Professor S. C. Prescott (Massachusetts Institute of Technology) says: "The ripe banana contains all the classes of food materials required for the human body. Although the amounts of protein and fat are slightly too low to constitute a perfectly balanced ration, the combination of bananas with milk, or its utilisation to supplement a diet containing a small amount of meat will produce a ration which is ample to take care of the body needs."

Summer Salads.

Tomatoes with chopped parsley and young onions.

Tomatoes (small) peeled and quartered, with diced cucumber, pieces of cheese, hearts of lettuce, moulded spinach, diced beetroot, and sliced egg.

Asparagus tips, chopped tomato, and broken cauliflower.

Diced beetroot with watercress, shredded cabbage or lettuce, cauliflower separated into flowerets with quartered hard-boiled eggs.

Diced cold boiled potatoes, finely-chopped onion, chopped celery, salt.

Cucumbers cut lengthwise and steamed until tender. Scoop out the seeds and fill with prawns or lobster mixed with mayonnaise. Serve these cucumber boats on lettuce. Decorate with whole prawns and sliced olives.

Red Heart Salad.—Set tomato jelly in a shallow pan and cut with a heart-shaped pastry cutter, arrange with hearts of lettuce.

Artichokes cooked and quartered served with thinly sliced oranges and chopped celery.

Stuffed Beets.—Scoop out the centre and fill with chopped cucumber, radishes, celery, and olives mixed with dressing.

Stuffed Tomatoes.—Scoop out the centre and fill with chopped tomato pulp, diced cucumber, salt, pepper, a little grated horse-radish and dressing, or chopped tomato, celery, raisins or sultanas, a very little green onion, a finely chopped sour apple, and dressing.

Chopped tomato, cucumber, cooked sweet bread (any white meat may be used instead), salt, pepper, capers, with dressing.

A Way of Serving Tomatoes.—Cut in halves and put together again with a layer of cream cheese, seasoned and moistened with salad dressing. Top with a sprig of parsley.

Banana, beetroot, cucumber, grated nut, and lettuce.

Orange, tomato, beetroot in mayonnaise jelly; serve on lettuce.

Pineapple, tomato, cheese in mayonnaise jelly; serve on lettuce.

Apple, celery, parsley, walnut, on lettuce.

Beetroot and green peas in mint jelly.

Combination Salad.—Tomato wedges, sliced cucumber, onion rings; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

Green Vegetable Salad.—Cooked string beans and peas, diced cucumber, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

Chiffonade Salad.—Cubes of cooked beetroot, sliced hard-boiled eggs, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with mayonnaise.

Carrot and Cabbage Slaw.—New carrots, cut in long fine strips; cabbage finely shredded mixed with vinegar; combine carrots and cabbage by tossing together lightly with salad dressing; serve thoroughly chilled.

Golden Glow Salad.—Diced pineapple, grated raw carrot, grated nut; on lettuce with mayonnaise.

Other Salads.—Macaroni salmon, sliced egg and minced onion; served on lettuce.

Baked apples, served with nuts and raisins on lettuce, garnished with currant jelly and mayonnaise.

Grapefruit and orange sections arranged on lettuce with fine strips of dates and figs; dressing.

Celery, cheese, and pineapple on lettuce; serve with dressing.

Pears and Asparagus Salad.—Half a pear for each serving; four or five asparagus tips, salt and pepper, and dressing; serve on lettuce.

Jellied Mayonnaise.—Any salad vegetables may be set in mayonnaise jelly, the recipe for which is as follows:—

Ingredients.

3 teaspoons gelatine.
3 tablespoons condensed milk.
2 dessertspoons vinegar.
1 egg (hard-boiled).
¼ teaspoon mustard.
1 teaspoon sugar.
½ teaspoon salt.
½ cup hot water.

Method.

Crush yolk of egg and sugar together in a basin, add mustard, salt, pepper, vinegar, and milk. Mix all thoroughly together. Dissolve gelantine in hot water, add to other liquid and blend. Pour on to prepared salad ingredients.

Poison in Paint—Danger to Children.

Lead-poisoning is by far the most common cause of the frequency of nephritis in Queensland, in the opinion of Dr. L. J. Jarvis Nye, of Brisbane, who, in his book "Chronic Nephritis and Lead-poisoning," urges the complete prohibition by law of the use of lead paint.

Dr. Nye gives figures to show that the increased death rate from chronic nephritis among young people in Queensland is a tragic reality, presenting an important field for research. Since 1928 he has been able to produce evidence that lead-poisoning in childhood has played an important part in causing the increased mortality.

"Of 87 patients questioned by me 71 said the paint on the verandas of houses occupied by them in their childhood was dry and powdery," he writes. "Forty-six were nail-biters or thumb-suckers, and in seven cases the parents said the child had been in the habit of licking raindrops from the veranda railings. Obviously the majority had been exposed to the risk of lead-poisoning."

Dr. Nye finds no support for suggestions that the frequency of nephritis in Queensland is traceable in any considerable degree to chronic tonsilar infection, syphilis, measles, diphtheria, malaria, or filaria, or to climatic conditions.

Investigating the possible sources of lead-poisoning, he dismisses the theory that the town water supply might be responsible to some extent, and comes to the conclusion that the most likely source is the paint on the walls of the houses and on the railings of the verandas. He attributes the lessening of the incidence of plumbism in Queensland to the education of the public on the subject, the legislative prohibition of the use of lead paint on veranda railings, the earlier recognition and treatment of cases by medical men, improved hygiene in the home and at school, the work of the Creche and Kindergarten Society, a change in the type of houses, and the introduction of an enormous number of non-poisoning paints.

Orchard Notes for February.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkept, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in

which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4½ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well-filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded, and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Furthermore, growers in the Stanthorpe district are reminded that luring the adult flies constitutes an important part of the present fruit fly campaign.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.,	No. of Years' Records.	Nov., 1934.	Nov., 1933.
North Coast.	In.		In.	In.
Atherton	2·28	33	8·42	5·14
Cairns	3·95	52	5·12	14·04
Cardwell	4·12	62	8·46	11·48
Cooktown	2·56	58	3·38	2·45
Herberton	2·56	48	6·26	6·01
Ingham	3·90	42	5·81	13·81
Innisfail	6·39	53	4·92	23·65
Mossman Mill	4·32	21	5·48	9·50
Townsville	1·89	63	3·06	5·86
Central Coast.				
Ayr	1·70	47	6·70	5·02
Bowen	1·29	63	2·13	3·57
Charters Towers	1·47	52	1·23	2·92
Mackay	3·15	63	3·38	13·65
Proserpine	2·92	31	6·05	10·81
St. Lawrence	2·36	63	8·86	7·89
South Coast.				
Biggenden	2·81	35	5·76	5·80
Bundaberg	2·53	51	13·93	6·66
Brisbane	3·81	83	5·68	8·41
Caboolture	3·49	47	8·25	8·30
Childers	2·79	39	5·78	7·82
Crohamhurst	4·34	40	7·97	11·89
Esk	3·28	47	4·05	7·44
Gayndah	2·95	63	7·32	6·38
Gympie	3·24	64	7·73	9·77
Kilkivan	2·58	55	5·04	4·50
Maryborough	3·22	63	5·77	8·84
Nambour	4·05	38	7·42	14·87
Nanango	2·71	52	7·50	6·87
Rockhampton	2·39	63	7·02	5·14
Woodford	3·25	47	7·29	7·13
Central Highlands.	In.		In.	In.
Clermont	2·07	63	2·20	7·60
Gindie	2·08	35	..	3·99
Springsure	2·17	65	6·17	6·72
Darling Downs.				
Dalby	2·78	64	5·46	7·16
Emu Vale	2·78	38	2·55	6·19
Hermitage	2·75	28	..	5·29
Jimbour	2·54	46	7·11	7·84
Miles	2·63	49	4·86	9·05
Stanthorpe	2·77	61	2·52	5·41
Toowoomba	3·37	62	3·65	8·45
Warwick	2·67	69	2·25	5·45
Maranoa.				
Roma	2·13	60	7·40	3·29
State Farms, &c.				
Bungeworgorai	2·24	20	8·39	4·24
Gatton College	3·03	35	2·83	11·15
Kairi	2·29	20	..	4·88
Mackay Sugar Experiment Station	2·89	37	3·81	11·82

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—NOVEMBER, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·85	87	70	91	18	61	3	338	10
Herberton	..	83	63	89	15,16,17	56	23	626	12
Rockhampton	29·93	86	68	93	10	61	1	702	13
Brisbane	30·00	79	64	88	14	58	4	568	12
Darling Downs.									
Dalby	29·95	82	60	89	7, 26	52	3	546	12
Stanthorpe	..	74	52	83	26	39	18	252	12
Toowoomba	..	76	57	85	11	49	18	365	13
Mid-Interior.									
Georgetown	29·86	98	71	103	17	61	23	474	7
Longreach	29·85	97	69	108	26	58	11	60	2
Mitchell	29·92	86	60	94	5	50	10, 11	525	11
Western.									
Burketown	29·84	97	77	105	16, 29	71	2, 24	15	1
Boulia	29·85	96	71	107	28	58	12	..	..
Thargomindah	29·87	89	67	107	29	55	10	121	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1935.		February. 1935.		MOONRISE. Jan., 1935.	MOONRISE. Feb., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·0	6·50	5·25	6·46	12·50	2·10
2	5·1	6·50	5·26	6·45	1·31	3·16
3	5·1	6·50	5·27	6·45	2·26	4·26
4	5·2	6·51	5·27	6·44	3·28	5·41
5	5·2	6·51	5·28	6·43	4·35	6·46
6	5·3	6·51	5·29	6·43	5·41	7·56
7	5·3	6·51	5·30	6·42	6·52	9·1
8	5·4	6·52	5·30	6·42	8·3	10·7
9	5·4	6·52	5·31	6·41	9·6	11·8
10	5·5	6·52	5·32	6·40	10·13	12·13
						p.m.
11	5·6	6·52	5·33	6·39	11·15	1·12
					p.m.	
12	5·7	6·52	5·33	6·39	12·17	2·9
13	5·8	6·52	5·34	6·38	1·18	3·3
14	5·9	6·51	5·35	6·37	2·20	3·52
15	5·10	6·51	5·36	6·36	3·18	4·36
16	5·10	6·51	5·36	6·36	4·14	5·14
17	5·11	6·51	5·37	6·35	5·5	5·46
18	5·12	6·51	5·38	6·34	5·54	6·18
19	5·13	6·51	5·39	6·34	6·37	6·48
20	5·14	6·50	5·39	6·33	7·14	7·17
21	5·15	6·50	5·40	6·33	7·47	7·45
22	5·16	6·50	5·41	6·32	8·18	8·13
23	5·17	6·50	5·42	6·31	8·44	8·48
24	5·18	6·50	5·42	6·30	9·13	9·24
25	5·18	6·49	5·43	6·29	9·42	10·6
26	5·19	6·49	5·43	6·28	10·13	10·56
27	5·20	6·48	5·44	6·27	10·46	11·53
28	5·21	6·48	5·44	6·26	11·26	..
					a.m.	
29	5·22	6·47				
30	5·23	6·47			12·12	
31	5·24	6·46			1·6	

Phases of the Moon, Occultations, &c.

5 Jan.	● New Moon	3 20 p.m.
12 ,,	☾ First Quarter	6 55 a.m.
20 ,,	○ Full Moon	1 44 a.m.
28 ,,	☽ Last Quarter	5 59 a.m.

Perigee, 6th January, at 9.42 p.m.
Apogee, 22nd January, at 8.0 a.m.

Orion comes into view about an hour after sunset on the 1st and rises 4 minutes earlier each evening. The Great Square of Pegasus, being 6 hours earlier, will be on the Meridian at the times mentioned. The Scorpion dissapears over the western horizon almost as Orion comes over the eastern.

On the 2nd the Earth will arrive at that part of its orbit which is nearest the Sun, which will then be at a distance of 91,330,000 miles, but it will not be so near our zenith at midday as on 23rd December by nearly one-half a degree.

The occultation of Antares by the Moon will take place about 5 a.m. on the 3rd if the observer is north of parallel 20 in Queensland. An interesting spectacle will be afforded for those further south, where the star may be seen to skirt the edge of the Moon much in the same way that it did on 15th September last, when (after the voting was over) a very interesting sight was afforded by the Moon and the same star.

A very slight partial eclipse of the Sun will occur on the 5th far south in the western hemisphere near the Antarctic circle. So slight will the eclipse be that only one-thousandth of the Sun's face will be obscured by the Moon. In Queensland no part of it will be obscured; in fact, the Moon will pass about 1 degree from the Sun on its southern side. As a corollary to this eclipse, a fortnight later, on the 19th, when the Moon is full, it will become eclipsed in the shadow of the Earth. Commencing, technically, at 10.38 p.m., it will not be till 11.53 that the Moon will reach the darker part of the Earth's shadow and become noticeable. One hour three minutes later it will be totally immersed, and according to the state of the Earth's atmosphere near the eastern or western horizon, it will become more or less lost to view. It frequently happens that bent rays of sunlight reach the Moon in sufficient quantity to make it clearly visible all through what is called a total eclipse. Rarely does a black eclipse occur when the Moon can hardly be seen.

On the 8th, about midday, Saturn, with the Moon about 4 degrees from it, may be seen in a north-easterly direction by observers having a telescope or binoculars.

4 Feb.,	● New Moon	2 27 a.m.
10 ,,	☾ First Quarter	7 25 p.m.
18 ,,	○ Full Moon	9 17 a.m.
26 ,,	☽ Last Quarter	8 14 p.m.

Perigee, 4th February, at 9.24 a.m.
Apogee, 18th February, at 9.12 p.m.

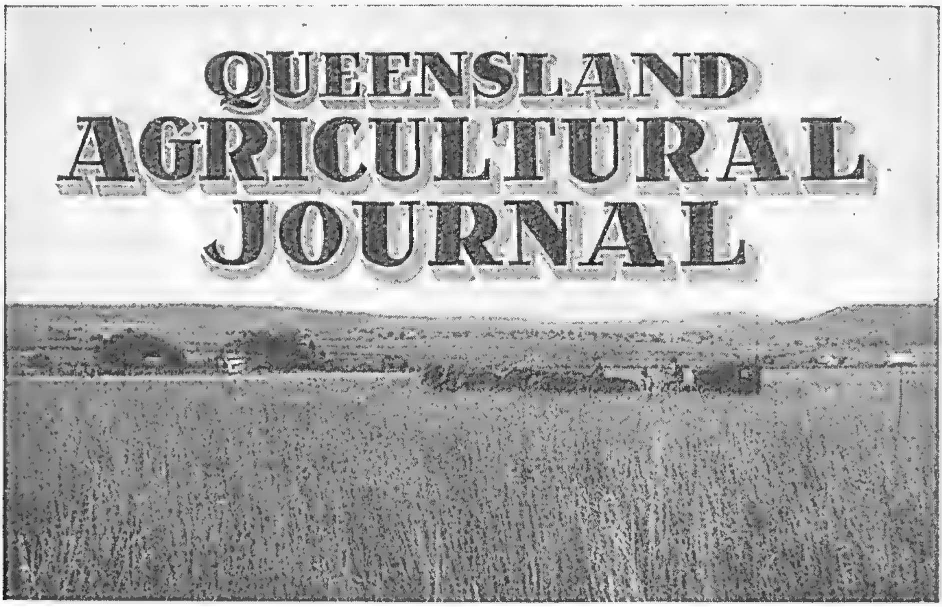
For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



VOL XLIII. 1 FEBRUARY, 1935. PART 2

Event and Comment.

Fruit for Distant Country Dwellers.

UNDER a scheme which has been approved by the State Cabinet, fresh fruit and vegetables will be delivered to people in the distant parts of the State by the Committee of Direction of Fruit Marketing at a quoted price, and the freight will be only 1s. a half-bushel case, with a reduction for larger quantities, no matter how far the fruit and vegetables have to be carried. Thus the bogey of lack of vitamins through difficulty in obtaining a regular supply of fresh fruit and vegetables will be swept away. All one has to do, under the new scheme, is to place an order, together with payment, with the nearest station-master or official, in charge of a station, who will be able to quote a standard price for what is required.

The Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said, in the course of a recent announcement, that towards the end of last year Mr. H. S. Hunter, an officer of the markets branch of the Department, had been detailed to make a special investigation into the possibilities of instituting a scheme for the distribution of fresh fruits, more particularly to the northern and western areas of the State.

Mr. Hunter discussed matters with the Committee of Direction of Fruit Marketing, and with officers of the Railway Department, and finally a scheme, involving the co-operation of all three organisations, was evolved, which had now received the approval of the Cabinet.

Reduced Freight.

The scheme, Mr. Bulcock continued, provided substantially that a minimum freight charge of 1s. a half-bushel case of fruit would be made, and with larger orders the freight would become correspondingly less. This price would include freight and service by the Railway Department and by the Committee of Direction, under the guidance and jurisdiction of the markets branch of the Department of Agriculture.

The actual scheme would operate by persons desiring to obtain fruit placing an order with the local station-master or officer in charge of wayside stations. The order must be accompanied by cash, and would be transmitted to Brisbane for execution by the Committee of Direction. A standard price list would be furnished, and the fruit would be forwarded in the most expeditious manner possible.

This scheme offered an opportunity to people in all parts of the State to obtain cheap fruit, merely by placing an order with the local railway official. The transport cost of a half-bushel case of fruit, including sales service, to Charleville, Cunnamulla, Quilpie, Biloela, Barcaldine, Longreach, Winton, Mackay, Proserpine, Townsville, Hughenden, Cairns, Atherton, Mount Isa, and intermediate stations covered by the scheme would be at a flat rate of 1s., involving in the case of Atherton railway transit equal to 1,309 miles, and in the case of Mount Isa 1,619 miles.

The scheme would operate at all railway stations west of Toowoomba, west of Warwick, from and including Gayndah to Monto, from and including Beecher to Monto and stations north and west of Rockhampton.

Quotations for the various fruits in season would be displayed from time to time on the notice boards at these railway stations, showing the prices at which the different kinds of fruit would be delivered.

Mr. Bulcock added that the scheme would embrace also the distribution of green vegetables, quotations for which would be displayed at railway stations, as in the case of fruit. All public and semi-public organisations in country districts were being invited to co-operate in the scheme.

The initial response to the scheme has been most gratifying. Numerous orders are coming to hand, many of which are from consumers served by the most distant stations on the far Northern and Western railway systems. There are indications that the residents of outback areas are co-operating to the fullest extent in the interests of the public health of those places. From information to hand, it is understood that private carriers are responding to the invitation of local bodies to convey from the railway to the inland consumer, at special rates, consignments despatched under the scheme.

The special half-bushel pack of assorted vegetables is proving most popular. It provides variety at a moderate cost, with a minimum of

waste. The adoption of the half-bushel case as the basis of the scheme has been done to meet the requirements of the average household. Even such fruits as bananas and pineapples are being put up in special half-bushel packs. If the scheme should provide a means whereby more fruit and vegetables can be consumed in country districts, advantage must accrue also to the growers in these times of glutted markets.

The Scheme Commended.

"It will be a very great godsend to everyone out in those districts," was the comment of a Brisbane doctor who has had considerable experience in the West. He said that of course everyone with the means was able to get fruit in the West, but the scheme certainly had big advantages for the poorer people. There was difficulty in getting fresh vegetables out there, and they were a big item, especially in times of drought, when the Chinese market gardens failed.

Medical research has taught the world a lot concerning diet in the last twenty years. It has shown that people may be fed abundantly with heating and energising foods, and yet may be ill-fed because they may not be receiving certain elements essential for the promotion of growth and the maintenance of the body's defences against various infections, and that this deficiency in their diet, which could scarcely be measured, may show itself in very grave diseases. Dr. E. Hirschfeld some time ago, in an address before the Royal Society of Queensland, succeeded in directing general public attention to the fact that these discoveries concern the welfare of Queenslanders very closely, and particularly those who are maintaining our greatest rural industry in the pastoral areas of the far West. To defective diet, and especially to the lack of fruit and vegetables, Dr. Hirschfeld ascribed the prevalence of Barcoo rot in the West and anæmia and lowered vitality among children. He also suggested that the incidence of ophthalmia might be much reduced by giving children more foods that supply vitamin A. Milk, cream, and butter are rich in this important vitamin; consequently, people living in our towns and dairying districts rarely suffer a lack of it. Drought in western districts, however, means that nearly everyone, including mothers and children, must go short of vitamin A so long as they depend for it on milk and cream and butter; but from fruit and many vegetables they could obtain this element on which the body relies for the maintenance of health. Dr. Hirschfeld's views are supported by many medical authorities, including Dr. Harvey Sutton, who has remarked on the western retreat of ophthalmia in New South Wales before the advance of settlement, and by Dr. A. Jefferis Turner, Director of the State Department of Infant and Child Welfare, who has been disseminating as widely as possible instruction concerning the vitamin values of foods.

In a subsequent address to Parliamentary representatives of western constituencies, Dr. Hirschfeld urged that the people of the West should be educated in the use of such vitamin-laden foods as fresh, green vegetables, fresh fruits, tomatoes, milk, butter, eggs, and other comestibles. He mentioned those foods particularly, for they are often difficult and certainly expensive to obtain. "Everyone who has lived in the West," he said, "knows what a heartbreaking job it is to grow vegetables without watering them every day." Our first business, therefore, was to make vegetables and fruit procurable in the western country regularly and at reasonable prices.

Red Scale of Citrus.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

OF the insects which attack citrus trees throughout the world probably none is more feared by growers than the red scale, and in so far as Queensland is concerned it must be counted as one of the most important factors limiting the production of citrus fruits. Other pests and diseases annually cause heavier losses over restricted areas or operate more extensively for limited periods, but red scale, in addition to being definitely the most important pest in some of the best citrus districts, is an ever-present menace in all. Even in those parts where it is ordinarily of but little consequence, as soon as conditions become suitable, which happens quite frequently in most parts, the scale quickly asserts itself and takes heavy toll of both trees and crop. On the whole, however, considering that the climatic conditions are theoretically so favourable for the development of the pest, Queensland orchardists must be considered fortunate that their losses are not much greater than is actually the case.

Description.

Actually, on the tree the insect itself is not usually seen, as whilst it is still of but minute size the insect exudes a secretion which completely covers the body. This secretion, or scale, as it is usually called, is of parchment-like texture and is only semi-translucent, and thus effectively hides the body of the insect from view. The scale of the female is circular in outline, slightly flattened at the margins, raised to a point towards the centre, and measures one-tenth of an inch in diameter in full-grown individuals. The central point is commonly of lighter colour than the remainder. The scale of the male is elongate and the raised portion, instead of being at the centre, is found towards the anterior or head end. Otherwise the scales of the sexes are similar. Though for most specimens the vernacular name describes the pest quite well, variations do occur, and at times the colour may appear reddish-brown or less often almost grey.

If the scale be removed from the female the insect is found to be roughly circular in outline, fat, and sluggish-looking, and generally of a deep-yellow or creamy-yellow colour. The female is legless and the most conspicuous feature is the structure of the mouth parts. These are rather complicated, but under a low-power lens appear to form a long, slender tube fitted for piercing, the length of which commonly easily exceeds that of the insect's body. The adult male is very different from the female, being a minute elongate creature with long legs and a pair of exceedingly delicate wings which are so fine that the slightest touch will tear them, and even the lightest breeze may dislodge them from the insect's body. The male again differs from his mate in that he has no mouth parts, the place of these having been taken during development by a pair of simple eyes. The male, of course, cannot feed and does not live long; probably twenty-four hours would be the longest adult life under ideal circumstances.

Life History and Habits.

The female does not lay eggs, but gives birth to living young, which remain for a day or two beneath the scale of the mother and then wander out to seek a feeding site. As a general rule they do not migrate far,

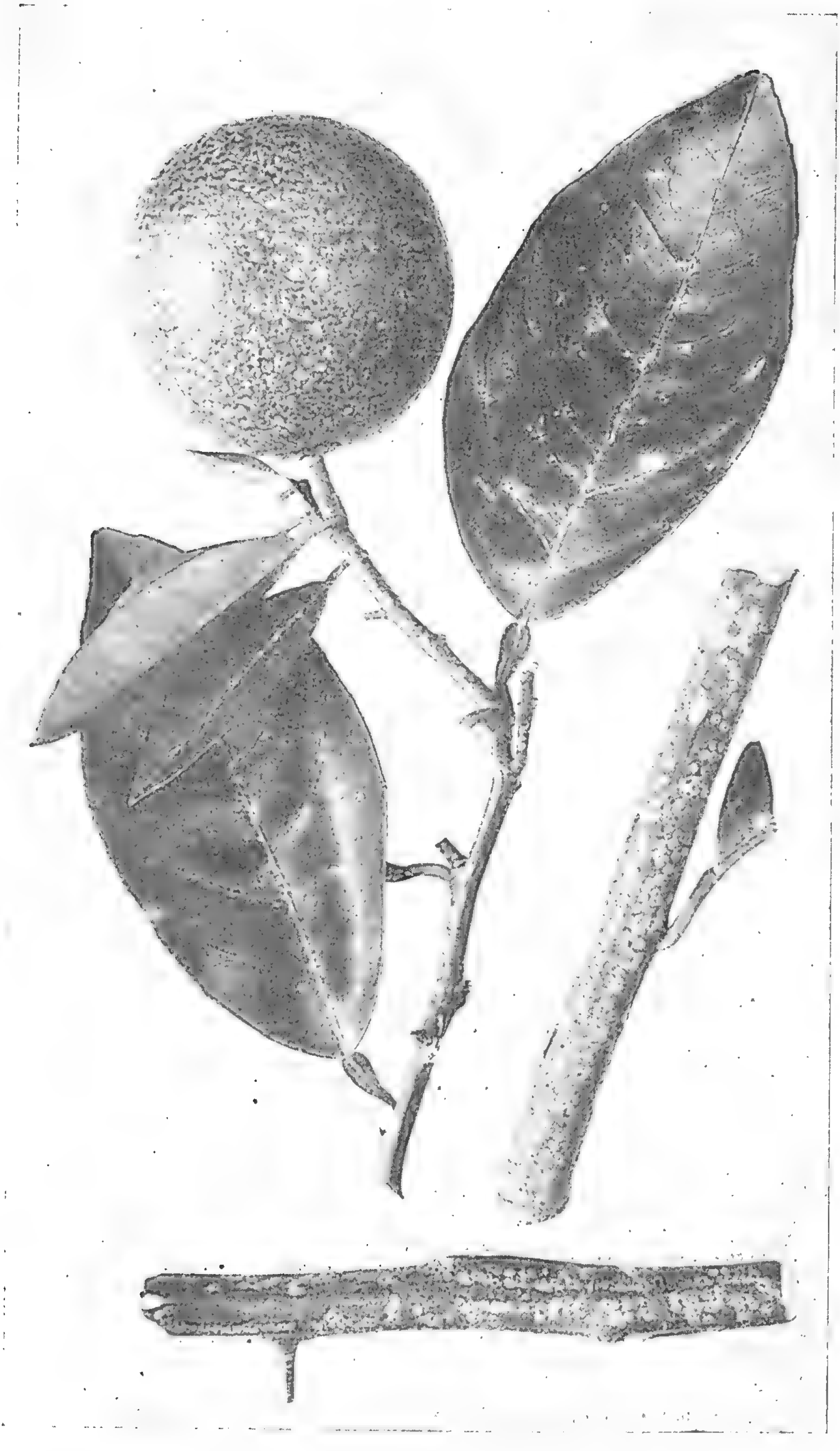


Plate 67.
Red Scale, showing infestation of fruit, foliage, and woody twigs.

but they are so minute that a very light breeze is capable of dislodging them and carrying them considerable distances. It is, in fact, largely by means of the wind that dispersal about an orchard or countryside is accomplished. As soon as a suitable site is found at which to feed the young settle down, insert their mouth parts, and from that time onwards, in the case of the female, do not move for the rest of their lives.

Red scale breeds practically continuously throughout the year in Queensland. Each female is capable of producing about eighty young, and these emerge over a period of about fifty days. Once reproduction is commenced it goes on continuously until just before the death of the female. As the great majority of the individuals complete the life cycle in approximately sixty days during the warmer weather, there is no clearly defined succession of generations. Experimentally it has been found that normally there are five complete generations each year in this State.

In Queensland the pest reaches its maximum intensity in the drier and hotter parts, and in every district it becomes more important in abnormally hot, dry times. The increase in importance is due both to the fact that effective reproduction is considerably increased and also on account of the trees at such times being less able to withstand its depredations.

The state of the tree as regards health and vigour is, in itself, an important factor in determining the extent to which it will be attacked by red scale. Invariably the more sickly a tree the more it will be favoured by this scale. Furthermore, the pest is usually confined at least in the first instance to the weaker and more woody parts where there is no great flush of sap. In the same way varieties which carry much tender supple wood are less prone to attack than the more woody and harsh varieties. Thus the free-growing Emperor of Canton mandarin, when healthy, is seldom found to harbour the pest, whilst lemons and grape fruit rarely fail to support appreciable colonies.

Red scale prefers parts exposed to the sun to those which are shaded, thus the first infestation on normally foliaged trees is to be found on the twigs, leaves, and fruit (Plate 67). On open or scraggy trees, however, the scale may be found on all parts even at the base of the trunk. Young trees, which, of course, have scarcely any part effectively shaded, are almost invariably subjected to the ravages of the pest.

It is a voracious feeder, and no plant can long sustain the depredations of a large colony. Weakening and killing of leaves and twigs is rapidly accomplished, and young worked trees may be killed back to the union of the bud and stock within a few months by colonies which cannot be considered very large. On older trees red scale frequently paves the way for the entry of other pests and diseases, and it is usually by the combined efforts of these that the tree is finally killed.

When infesting the fruit, though direct damage is done, in most cases the principal objection is that the fruit is rendered unsightly and must be brushed before it can be marketed. This brushing, besides costing both time and money, is bad for the fruit, as the rind is, contrary to the general impression, very tender. The injury to the rind is seldom apparent to the naked eye, but the surface cells are disrupted and this facilitates the entry of mould fungi and thus leads to loss of

fruit. This is an indirect effect of the scale but the loss must be attributed mainly to the pest. The direct effects are chiefly arrested development and reduction in size.

Red scale breeds freely on fruit stored after harvesting and the young crawl from fruit to fruit and box to box. As lemons are usually stored for a few months after being picked, this is a most important point, for one badly-infested fruit may lead to the whole consignment becoming affected. Care must therefore always be taken to see that no fruit harbouring living red scale is included in a storage lot.

The pest is attacked by a number of natural enemies, and at times these certainly accomplish an appreciable measure of control. However, it is rarely possible to rely on natural enemies to materially reduce the population once this has assumed pest proportions, and growers generally must adopt artificial means of control.

Control.

The first step in the fight against red scale in humid coastal districts is to attend to the general health of the tree. It may be that some other pest or disease is adversely affecting the tree, but more commonly all that is required to reduce the red scale population to insignificance is the judicious use of fertilizers coupled with good cultural practice. Of course, direct methods of control will also have to be used in these cases in the first instance.

In drier districts where the insect is a pest of otherwise healthy trees, or in other parts when the health of the tree is being attended to, artificial control may be accomplished by fumigation or by the use of certain sprays. Where conditions permit of the operation, fumigation with hydrocyanic acid gas is to be recommended as the best method of combating the pest. Oil sprays, preferably white oils, or resin-caustic soda-fish oil mixture may also be used with success.

As important as the choice of insecticide is the choice of time of application. Even if an excellent kill be obtained it does not necessarily follow that a lasting control will be established. If the control operations are carried out just before a period of prolific reproduction, it is obvious that the population may be again built up quickly.

By far the best time to combat red scale in Queensland is from the middle of March to early in April. If a good control be established at this time, even in the most severely affected districts, the trees will normally remain commercially free of the pest for at least twelve months. The later the operation the better, but it must always be remembered that red scale may require a month or more to fall from the fruit after death and the fruit may still require brushing unless a sufficiently long interval elapse between treatment and harvesting. Further, oil sprays if used too late tend to interfere with the artificial colouring, and late application of this class of spray should, therefore, be avoided on those early varieties which normally have their sweet juice content some time before the colour turns. In western districts the scale may build up large populations as early as January. All that can be done then is to water the trees as heavily as other conditions permit and in this way hold the condition of the trees as long as possible.

Young trees which are heavily infested when they arrive from the nursery should not be accepted, as such trees are very liable to be either killed altogether or stunted during their early life, and are thus never satisfactory. Any young trees may carry a light infestation and this does not matter greatly as it will be found that with most varieties the infestation is thrown off as soon as the trees become established. Light oil sprayings may be given to young trees, but care must be taken. The soil round the base of the trunk should be hilled up during the spraying and then pulled back. This prevents any accumulation of oil round the union or close to the roots where it has far-reaching ill-effects.

QUEENSLAND SHOW DATES, 1935.

February.

Stanthorpe, 6 to 8.
Killarney, 15 and 16.
Clifton, 27 and 28.

March.

Allora, 6 and 7.
Milmerran, 12.
Goombungee, 15.
Pittsworth, 20 and 21.
Warwick, 26 to 28.

April.

Toowoomba, 1 to 4.
Tara—Show 3, Campdraft 4.
Dalby, 10 and 11.
Crow's Nest, 10 and 11.
Oakey, 13.
Kingaroy, 11 and 12.
Chinchilla, 16 and 17.
Nanango, 16 and 17.
Miles, 24.
Sydney, 15 to 24 April.
Dirranbandi, 24 and 25.
Rosewood Campdraft, 27.
Taroom Campdraft, 29.

May.

Wallumbilla, 1 and 2.
Taroom, 1 and 2.
Beaudesert, 1 and 2; Campdraft, 3 and 4.
Wondai, 2 and 3.
Goondiwindi, 3 and 4.
Longreach, 6 to 9.
Murgon, 9 to 11.
Blackall, 13 to 15.
Mitchell, 15 and 16.
Mundubbera, 15 and 16.
Goomeri, 15 and 16.
Barcaldine, 21 and 22.
Ipswich, 21 to 24.
Gympie, 22 and 23.
Biggenden, 23 and 24.
Toogoolawah, 24 and 25.
Kalbar, 25.
Maryborough, 28 to 30.

June.

Marburg, 1 to 3.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Boonah, 12 and 13.
Esk, 14 and 15.
Warrilview, 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Gatton, 3 and 4.
Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Cairns, 23, 24, 25.
Atherton, 30 and 31.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.

September

Imbil, 6 and 7.
Tully, 13 and 14.
Innisfail, 20 and 21.
Rocklea, 21.
Kenilworth, 28th.

Top Rot of Pineapples and Its Control.

By H. K. LEWCOCK, M.Sc., B.Sc.Agric., Assistant Plant Pathologist.

TOP rot is a disease of pineapple plants which is becoming increasingly prevalent in Queensland. At the present time the losses occasioned by this disease are exceeded only by those resulting from wilt.

As the name implies, top rot destroys the white, succulent, terminal portion of the stem as well as the bases of the young heart leaves which arise from it. The tough, outer leaves and the lower woody parts of the stem are rarely affected. In some localities in Queensland this disease is referred to as "wet rot," whilst in Hawaii it is known as "heart rot." The latter name is particularly appropriate.

Description of the Disease.

Top rot usually occurs in young plants before they have fruited, but older plants may sometimes be affected. Shortly after infection occurs, the central or heart leaves of diseased plants exhibit pronounced colour changes ranging from a drab olivaceous green to shades of red, but the outer leaves may retain their normal green colour and rigidity until the disease is well advanced. Affected leaves, being cut off from their water supply, dry out rapidly and curl backwards along their edges. When this occurs, they take on a characteristic smoky-brown appearance. In the final stages of the disease, the rotted tissue disintegrates and the leaves fall prostrate on to the ground.

A slight pull will detach the terminal crown of leaves from the stem of a top rot-affected plant, even before the foliage symptoms have become well-defined, and this is a useful method of identifying the disease in its initial stages. The bases of affected leaves display a foul-smelling, putty-coloured rotted area, which is sharply demarcated from the upper green parts of the leaves by a very distinct and characteristic brown margin. The apex of the stem exhibits a similar type of rot which, ordinarily, does not extend into the woody, fibrous tissue of the rootstock. This stem rot is also characterised by a well-defined brown margin.

Suckers sometimes shoot from the woody rootstocks of plants which have been affected with top rot. These new growths may remain healthy and ultimately produce fruit, but usually they succumb to the disease at an early stage in their development.

Cause of the Disease.

Top rot is an infectious disease caused by a fungus which invades the plant through fresh cuts or injuries, through decaying roots, or through the tender apical tissues of the stem. In Hawaii, it has been reported that several related fungi belonging to the genus *Phytophthora* are capable of causing top rot in pineapples, but only one of these, *Phytophthora cinnamonii*, has been found to be associated with the disease in Queensland. *Phytophthora cinnamonii* is also an active cause of pineapple wilt. In the latter disease the fungus attacks and destroys the roots, and it has been found that top rot may sometimes develop from such root infections should the rotting of the root tissues continue upwards into the stem. The initial sporadic top rot infections, which usually appear about mid-winter, may frequently be traced to diseased

roots. If these first-affected plants are not quickly removed, they may later become centres from which a widespread infection of other plants occurs at or above the ground level. Under favourable moisture and temperature conditions, fungus spores are liberated from the rot-affected leaf bases and stems and, during heavy rains, these spores are disseminated to healthy plants by the movements of surface water.

The causal fungus of top rot is able to survive in the soil for considerable periods of time, and since it is also an active parasite of pineapple roots the disease is likely to reappear indefinitely on land once it has been contaminated with the fungus.

Factors Influencing the Occurrence of the Disease.

Losses from top rot occur chiefly during the winter and spring months. Young plants up to twelve months old are most subject to attack, but mature plants which have fruited may also occasionally succumb to this disease.

The occurrence of top rot in a field of young pineapples may be restricted to isolated plants scattered here and there throughout the plantation, but it is more usual to find certain areas exhibiting a high degree of infection whilst the remainder of the plantation is practically free from the disease. A loss of from 50 to 60 per cent. has been noted over portions of affected plantations. The Ripley Queen pineapple appears to be more susceptible to top rot than the more widely-grown Smooth Cayenne variety, but this is possibly due to the fact that the former variety is grown almost exclusively in the neighbourhood of Brisbane on soil which is frequently both shallow and poorly drained.

The incidence of top rot disease and the extent to which it may develop is largely determined by environmental conditions. Within a given field these may vary considerably from year to year. In Queensland top rot causes serious losses only in seasons when the rainfall is exceptionally heavy. Even in wet years, however, epidemic outbreaks of the disease are restricted to low-lying, shallow, and inadequately-drained soils or to relatively flat land which is subject to flooding during heavy rains. Differences in topography explain why the disease has long been prevalent in some localities but quite unknown in others.

Plants propagated from tops or slips are more susceptible to the epidemic form of the disease than those grown from suckers. The loose, open structure of the first-named types of planting material renders their tender heart tissues especially subject to pollution by contaminated flood waters, and thus the chances of infection taking place are greatly enhanced.

Control Measures.

Although the causal fungus of top rot is also the organism chiefly responsible for the losses occasioned by pineapple wilt, different parts of the plant are involved in these two diseases, and somewhat different methods of control are required to combat them.

Top rot seldom causes serious trouble on sloping, well-drained land and, consequently, no special precautions are necessary in hilly districts except to dig up carefully and then destroy any affected plants as soon as they appear. If this is not done, the disease may spread downhill from the diseased plants over narrow fan-shaped areas. On relatively flat land, however, or in shallow, poorly drained soils, it is recommended

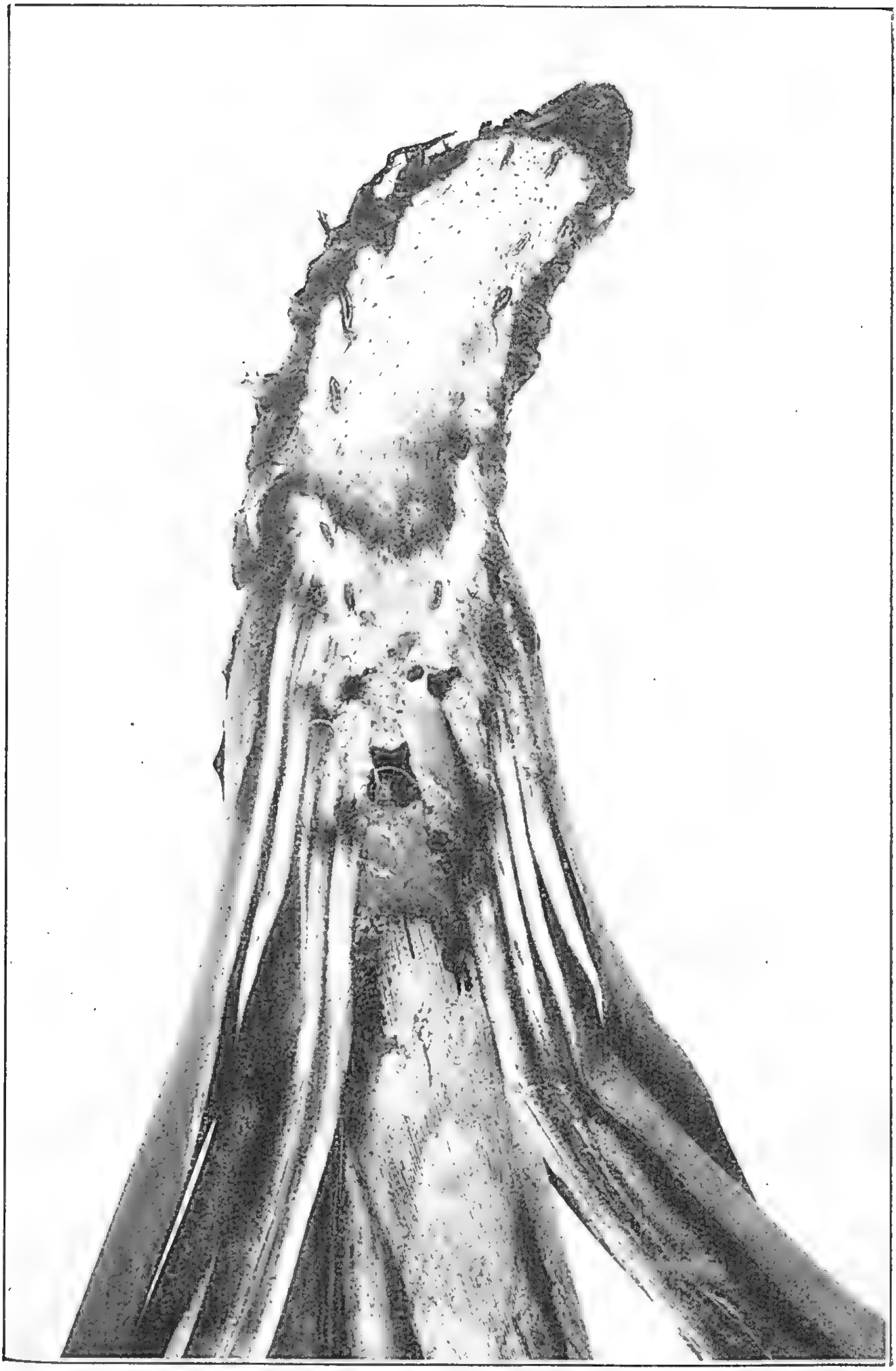


Plate 68.
Longitudinal section of Pineapple affected with Top Rot.

that the suckers or slips be planted on low ridges in order to ensure a quick run-off of surplus water from around the roots, and also to avoid the possibility of contaminated flood waters coming into contact with the young plants.

Objection has been taken to the ridge method of planting on the ground that by the time the plants are three or four years old they are so far out of the soil that the ratoon or sucker growths cannot root properly, but this can be obviated to a large extent by continually working the soil up towards the plants. However, whether the ridge method of planting is adopted or not, plantings on flat country should on no account be made in shallow trenches. When this is done, water collects in and flows along the trenches during wet weather, with the result that whole rows of plants may become infected with the top rot fungus. This is particularly likely to happen when a few scattered diseased plants are present in a plantation, as, under favourable conditions, these may become potent sources of infection. It is obvious, therefore, that plants affected with top rot should be carefully removed from the plantation as soon as they are detected, since further spread of the disease may be considerably checked in this way. Even when a new sucker growth appears from below the rotted region of the stem it is unwise to leave the rootstock in the ground, as the remains of the previously rotted portion may later serve to spread the disease to other plants.

In Hawaii immersion of suckers or slips in a fungicide prior to planting has recently been recommended as a preventive treatment against top rot when replanting land on which the disease has previously been in evidence. The fungicide used is a specially-prepared Bordeaux mixture consisting of 1 lb. of crystalline copper sulphate (bluestone "fines") and 1 lb. of fresh hydrated lime to every three gallons of water. Fresh burnt lime (quicklime) may be substituted for hydrated lime where the latter is not available, but only three-fourths of the quantity is required—viz., ¾ lb. of quicklime to each three gallons of fungicide. The procedure recommended by Mehrlich in Hawaii for preparing and using this Bordeaux mixture is as follows:—The bluestone is first dissolved by suspending it in cheesecloth in one-half the quantity of water required for the complete fungicide, using an open wooden cask or a well-tarred oil drum as the container. Shortly before the Bordeaux is to be used, the hydrated lime is thoroughly mixed with the remaining water in a separate container. While stirring the copper sulphate solution the lime suspension is poured into it. The mixture should be thoroughly stirred both before and during treatment of the suckers or slips. Before use, however, the freshly-prepared fungicide should be tested in the customary way with blue litmus paper or a clean, bright knife blade. Only vigorous suckers or slips which have been stripped about two weeks prior to planting should be selected for treatment with this Bordeaux dip. These should be wholly immersed in the freshly-prepared fungicide, preferably in the field where they are to be planted, and they may be planted either before or shortly after the fungicide has dried upon them.

Mehrlich reports that this Bordeaux mixture dip has given better control of top rot than larger quantities of the same or different fungicides applied in other ways. In repeated tests under conditions extremely favourable to the disease, an average control of 80 per cent. has been obtained from its use. When the fungicide is prepared

according to the procedure outlined in the preceding paragraph no injurious effects have been observed to result from its use, but on account of the cost and labour involved it is probable that it will be found economical to employ it only for treating planting material intended for old land on which outbreaks of top rot have occurred in previous plantings. On new land cultural precautions alone should give an adequate measure of control.

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Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

The Common Bracken.

(Pteridium aquilinum.)

By C. T. WHITE, Government Botanist.

Description.—A coarse, robust fern with creeping underground stems often covering extensive areas of country. Fronds erect, mostly 2-3 feet high and 1-2 feet across, but varying considerably in size according to situation and locality. Spores borne on the under surface of the fern in long, narrow lines close to the margins of the lobes of the frond.

Distribution.—Bracken in one form or another is widely spread over both the temperate and tropical regions of the world. Many varieties of it have been described.

Botanical Name.—*Pteridium,* meaning similar to *Pteris,* a very large genus of ferns; *pteris* was the name applied by the ancient Greeks to ferns in general; *aquilinum,* from Latin *aquila,* an eagle, from the old English name of the plant—Eagle Fern.

Uses.—In Europe Bracken has been used from time immemorial for a multiplicity of purposes—the young roots cooked as greens, the rhizomes ground into a meal for adding to ordinary flour, the fronds as thatch for houses and bedding for animals, both stems and leaves for distilling a root beer with supposed tonic virtues, the ashes for the manufacture of soap and glass, the whole plant as a tan for dressing kid and chamois leathers, &c.

Poisonous Properties.—It has been definitely proved by feeding tests in England and elsewhere that the Common Bracken is poisonous to stock, though apparently large quantities of it have to be eaten before any ill-effects are noticed. Cattle affected by Bracken Fern generally show prominent gastric trouble accompanied by emaciation and a high temperature. In cases of reputed bracken-poisoning in Southern Queensland a feature recorded has been bleeding at the nostrils, and this condition is one recorded in feeding tests in England. Young stock seem to be more affected than old. In cases of bracken-poisoning in New South Wales, Seddon and McGrath record the principal features to be loss of condition, diarrhœa and dysentery, and death as a rule after a comparatively short period of illness, or less commonly only after two or three weeks. They further state that the Bracken is only indirectly the cause, the real trouble being due to a microbe which is responsible for the symptoms of fever, dysentery, and hæmorrhagic septicæmia. They state that the microbe associated with the disease is not capable of producing ill-effects in healthy stock, and that mortalities are really due to the Bracken, which lowers the resistance of the animal to the disease. They report that their investigations at the Glenfield Research Station have definitely shown the relationship of the two conditions, and that Bracken is to be regarded as a very harmful foodstuff.

Eradication.—In coastal Queensland Bracken is often a serious pest of pasture land. In very light, sandy soil the fronds with portion of the rhizome or underground stem can be pulled up. In ordinary pastures, however, this is not usually practicable, and the usual practice

PLATE 69.—THE COMMON BRACKEN.

is to knock down the fronds with a stick, experienced farmers stating this has more effect on the plant than mowing or cutting off with a sharp implement such as a fernhook or brushhook. Heavily pasturing the land, particularly with steers, who eat the young shoots and break down a lot of the fronds by camping on them, is said to work well in keeping the fern in check in larger areas.

Botanical Reference.—Pteridium equilinum (L.) Kuhn, v. Deck Reisen 3, Bot. 11, 1879; *Pteris aquilina* Linn. sp. 2, 1075, 1753.

Lameness in Pigs.

By K. S. McINTOSH, B.V.Sc., Government Veterinary Surgeon.

LAMENESS in pigs may be classified into four groups:—

1. **Rickets.**—This condition is due to insufficiency of mineral matter in the feed and lack of the essential vitamine which enables the animal to utilise same.

The hard supporting substance of the bones consists largely of calcium (lime) and phosphorus, and unless the animal receives an adequate supply of these materials its bones do not develop normally (*i.e.*, become hard and flinty) but become soft and spongy.

The effect of this bone weakness is most noticeable in the limb bones, as these carry the weight of the animal. The legs may become either "bowed" or "knock-kneed" and there is usually some enlargement at the joints. These enlargements are not very painful, but there is a tenderness of the joints and bones and this, together with the physical deformity, causes an irregular and disturbed gait.

If such an animal be killed and a postmortem examination held the bones may be easily pared with a knife, the ribs break like cardboard, and a row of enlargements is seen at the junctions of the ribs and their cartilages.

Calcium and phosphorus also assist in the formation of many other tissues such as blood and muscle, and for this reason affected pigs are often poor, weedy, and more prone to other troubles such as indigestion owing to impaired vitality.

The age at which pigs are most commonly affected is from the weaner to the porker stage. Brood sows are also liable to be affected since the formation of the young pigs or fœtuses and the subsequent drain through the secretion of milk demand large quantities of mineral matter which are supplied by the sow.

The prevention of rickets lies in proper feeding. Fortunately we have a cheap and effective mineral supplement in ground rock phosphate and an easily procurable supply of vitamine in green leaves. Lucerne is particularly recommended, as it is an excellent feed for pigs and contains a relatively high proportion of vitamines. Wherever ground is available an attempt should be made to grow lucerne. It has been found that pigs fed on a diet of skim milk and maize frequently develop rickets, but if greenstuff is fed daily, also 1 dessertspoonful of ground rock phosphate per pig per day, no such trouble is encountered. In addition, pigs will gain more rapidly in weight when the mineral and greenfeed supplement is used.

2. **Germ Invasion** of the joints and adjacent structures. Infection of pigs may take place at or shortly after birth via the navel cord, or later by the ingestion of contaminated feed, &c.

In early infections the trouble is usually severe and the course rapid, many of the young pigs dying within a week or so.

Later infections may affect the joints and adjoining structures, causing the formation of pus swelling and inflammation of the part with severe lameness. The knees and hocks are most commonly affected,

then the stifle and elbow joints. The part is very painful and there may be a discharge of pus from the swelling through one or more small openings.

In New South Wales another germ was found which attacked the ends of the bones just under the joint cartilage, and whilst the lameness and pain are very severe no very striking changes can be seen. If the bones of an affected joint are boiled and the cartilage stripped off, the joint surface of the bone (*i.e.*, under the cartilage) is found to be distinctly pitted. This form has also been found in Queensland.

The above germ diseases are associated with bad methods of housing, feeding, and hygiene. When pigs are affected it pays to get rid of them as soon as possible before they lose condition. In the case of suckers suffering from navel infection do not waste time in treatment, but concentrate on preventing trouble in subsequent litters. Allow the sow to farrow under scruplously clean conditions and this trouble will disappear.

Throughout its life the pig should be kept under condlitions of strict cleanliness. The animal should have adequate shelter from sun, rain, wind (particularly draughts), and should not be kept in damp, muddy sties. Mud wallows are undesirable from every standpoint.

Feed troughs should be made of iron or concrete and kept clean. It is impossible to clean a wooden trough thoroughly and the small extra expense incurred in purchasing suitable troughs will be repaid later by healthier pigs. Clean, fresh food and clean containers and utensils are of paramount importance. Many farmers believe in feeding "sour" skim milk, but, unfortunately for the pigs, this means not pure sour milk as we see in a cheese factory, for example, but putrid or decomposed milk. It is usually held before feeding in a cask or vat crusted with the accumulation of months—perhaps years—of decomposing material, containing countless millions of putrefying and perhaps disease germs.

Is it any wonder that when such is given to young pigs lameness, digestive and other troubles occur?

3. **Suppurative Otitis.**—Strictly this is not a lameness but a loss of sense of equilibrium and direction caused by the formation of pus in one or both ears. In each ear there is a delicate system of "spirit levels" which gives the pigs their sense of direction. When these are destroyed by pus formation the pig moves in circles, usually with the affected ear down towards the ground.

The ear infection is usually an extension of some catarrhal condition of the throat, but the germs may possibly gain entrance via the outer ear. Many people believe that the condition is caused by pouring milk into the pig's ears during feeding, but probably this is not a common cause.

For prevention strict attention should be paid to housing, feeding, cleanliness, and general management as outlined above.

4. **Pig "paralysis."**—This obscure condition has been investigated by a number of workers—notably W. A. C. Frazer, at Glenfield Research Station, New South Wales.

The symptoms are loss of co-ordination of the muscles of the hind limbs. Crossing or plaiting of the hind legs and knuckling over on the

fetlocks are early symptoms. Later the animal is totally unable to support its hindquarters and progresses by means of the front legs. In time the front legs may also be affected. The voice changes to a high-pitched "falsetto monotone."

Whilst the animals can get sufficient feed and drag themselves about they frequently retain their condition which is usually good, but if the forelegs are affected they commence to lose weight.

The cause and treatment of this complaint is at present unknown, and the most economical method is to sell the affected pigs to the butcher before the trouble is too far advanced.

5. **Miscellaneous.**—Under this heading we may include wounds, fractures, tuberculosis of bones and spinal column, inflammation and growths of the brain and spinal cord, and parturient paraplegia of sows. The last-named is associated with the act of farrowing. Just before or just after the act the sow suddenly loses the use of her legs. Good nursing and laxative diet are the main methods of treatment.

Kidney worm is often thought to be the cause of staggery gait, but the latest work has shown this to be extremely rare. Occasionally a worm will "wander" into the spinal canal and cause staggering, but if situated in the normal position, *i.e.*, kidney fat, such is not the case.

Any disease such as pneumonia, severe enteritis, infestation by parasites, &c., which causes general disturbance of the body functions, may cause muscular inco-ordination or staggers, and here, of course, treatment lies in eradicating the primary trouble.

This article has touched on several complaints of pigs which are not true lameness but which cause disturbance of gait, but as these are often confused with true lameness they should be taken into consideration by the farmer if locomotory troubles should arise.

In conclusion remember that—

Strict cleanliness of sties and feeding utensils,

Proper feeding,

Adequate shelter and housing,

Protection against internal and external parasites (see advisory leaflet No. 2),

are the fundamentals of profitable and successful pig raising.

TO MAKE WHITE LEATHER.

Soak the hide for forty-eight hours in clean cold water. For fleshing and unhairing, make up ½ lb. unslaked lime and ¼ lb. salt to each gallon of water required to completely immerse the hide, and soak for twenty-four hours, when most of the hair and flesh can be scraped off. Make up a second soak, using lime only. Then the hide can be scraped free of every particle of hair and flesh. A further soaking in clean cold water will then be necessary. For a first curing soak, use 4 oz. alum to each gallon of water, and for the second, 6 oz. About two days in each will be sufficient. Before the hide is taken out, cut it and see if there still remains a streak of colour inside. The curing must go on until the hide is white right through. Allow the hide to partially dry in a dark place away from the wind, and then rub in as much fat, tallow, or melted paraffin wax as it will hold.

Litter Recording of Pigs.

By L. A. DOWNEY, Instructor in Pig Raising.

THE value of litter recording has been stressed by this Department on numerous occasions, and at least one pig breeder has taken up the work in earnest.

In the August issue (1934) of the "Queensland Agricultural Journal" there appeared a report of a litter of Large White pigs owned by Mr. A. G. Stewart, of Strathmore Stud, Cedar Pocket, via Gympie. This litter, from the sow "Highfield Jewel 4th," was reared by hand owing to a mishap to the sow; it consisted of nine pigs, which weighed 459 lb., or an average of 51 lb. when eight weeks old.

The next litter tested at Strathmore Stud was from the Large White sow "Norfolk Bonetta 4th." This litter consisted of eight pigs, which averaged 48½ lb., a total litter weight of 388 lb. at eight weeks old, and as this litter was exhibited at Brisbane Show the rate of growth was probably retarded somewhat owing to transport and changed environment.

The last litter to complete its test at Mr. Stewart's stud is from the Large White sow "Highfield Jewel 4th," and sired by "Gatton Junker." Thirteen live pigs were born on 9th November, 1934, one pig died on the following day and another was taken from the sow on that day, leaving her with eleven pigs.

The birth date and final weights of this litter were checked by officers of the Department and are shown as follows:—

Tattoo Number.	Boars.								Sows.		
	65	66	67	68	69	70	71	72	73	74	75
Weight at birth ..	3	3	3	3	3	2½	3	3½	3½	2	3
,, ,, 1 week	5½	7	6½	6½	6½	5½	6	7½	7½	3½	5½
,, ,, 2 ,,	10	12	11½	11½	11½	7	11	12½	12	7	9
,, ,, 3 ,,	15	16½	16	16	15½	8½	16	17	16	10	11½
,, ,, 4 ,,	18	19	18	20	19	10	17	19	19	11	13
,, ,, 5 ,,	24	23	22	23	25	14	23	22	26	14	16
,, ,, 6 ,,	30	34	30	80	34	20	29	27	33	19	21
,, ,, 7 ,,	36	38	35	38	39	28	35	34	40	27	30
,, ,, 8 ,,	43	43	41	46	46	35	42	40	47	34	36

Total at 8 weeks .. .. 453 lb.

Average at 8 weeks .. .. 41·1 lb.

The Identification of Pigs.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising and Supervisor of Grading.

AS Regulations under "*The Queensland Pig Industry Act of* 1933" make identification of all pigs offered for sale or disposal compulsory, farmers, agents, dealers, and others interested in the sale and purchase of pigs should be conversant with the various systems of identification of this class of animal and of their application in accordance with the Act and Regulations.

For instance, Regulation 6 reads as follows:—

> "Every pig offered for sale, barter, or exchange shall be branded by the vendor with a body tattoo or other approved method of branding. In the case of sucker, weaner, store, or other pigs not intended for immediate slaughter, ear-tattooing, or ear-marking shall be an approved method of branding. Such branding shall take place within seven days prior to such sale, barter, or exchange."

REGISTRATION OF BRANDS.

Departmental stock inspectors stationed in various centres throughout the State are in a position to advise farmers as to the advantages or otherwise of registration of earmarks for pigs, and their services should be requisitioned by all farmers who are in doubt on any of these matters, especially as it is necessary in effecting registration to have particulars of any registered marks used by neighbouring farmers.

There are five or more systems of identification of pigs in regular use in this State, each of which has its own particular advantage. These systems are ordinarily defined as follows:—

- Firebranding;
- Body-tattooing;
- Earmarking (inclusive of use of ear tags) and ear buttons;
- Ear-tattooing;
- Paint and hair-clip marking (inclusive of cutting of hair on tail—i.e., bang-tail).

MARKING SYSTEMS.

Firebranding.

For marking live pigs this system of identification has been in use throughout the world for many years and is used frequently by farmers here, especially by those who are not conversant with or in favour of other systems.

It may be said that while there are many objections to identifying pigs by the use of a redhot iron brand, the system has its place and doubtless will continue to be used until a more efficient system of identification of the live animal is introduced. Efficient firebranding has the advantage that it is a method of marking live animals as well as carcasses; in itself the system is an effective one if carefully applied with a suitable brand that is not overheated, or held too long, or pressed too deeply on the body, as it results in a reasonably clear and legible skin and body mark. It is the abuse of such a system which brings it into discredit, and firebranding certainly is abused, as many otherwise suitable carcasses have to be degraded and many rejected by reason of excessive and cruel firebranding. Suitable iron and copper firebrands may be purchased at from 12s. 6d. to 15s. each, while there has also recently been introduced a self-heating branding iron for the firebranding of other classes of stock, such irons working on the principle of petrol-heated household irons and other electric heating appliances. It is hoped that eventually this old-time system of identification will be replaced by a more efficient and less objectionable method, but such a method of live-pig body marking has not yet been developed sufficiently for use on pigs, though acid, steam, and other types of brands have been used and are still undergoing research in this and other States.

For purpose of ascertaining the views of prominent men associated with the pork and bacon trades, circulars were recently forwarded by the Department to a number of bacon curers, pork exporters, and stock agents in this State asking them to express their views on firebranding. Practically all indicated a general desire for a better system than the use of the firebrand, especially for use in marking animals whose carcasses are intended for the export trade.

Firebranding has one special advantage in that is is used to identify live pigs belonging to various owners where such pigs are forwarded together as mixed consignments to auction sales and factories, consignments in which body-tattooing of carcasses would not be sufficient. In some instances, however, earmarking and ear-tattooing of such pigs could be used to just as much advantage and with less objection than firebrands.

Where properly applied, firebrands on pigs will be legible for two months or more, but after that period they gradually disappear and are difficult to decipher either on the live animal or on the carcass, and thus they become unreliable and objectionable.

Body Tattoo-marking.

This is an efficient and the most practical system of marking in the identification of pork and bacon pig carcasses, and during recent years has been almost universally adopted by bacon curers and pork exporters in Queensland. Correct identification of carcasses is an essential in the treatment of pigs by factories, and more particularly where payment is made on a basis of official grading; hence the necessity for a reliable method such as this.

Additionally, it is necessary to identify owners of pig carcasses in order that refunds or non-payments may be correctly adjusted where, on slaughter, carcasses or parts thereof are condemned by Government inspectors as unfit for the use of man. Body-tattooing is particularly valuable in thus identifying ownership, and also in providing necessary information in tracing diseased animals to the farm, saleyards, or other place of origin.

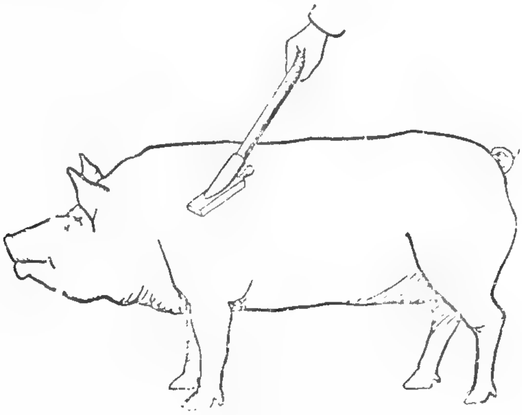


PLATE 70.

The Austral pig-body tattoo showing position favoured for the identification mark on the carcass. This instrument has needles of the gramophone type, and is supplied by manufacturers complete with nickel-plated headpiece and wooden handle. The numerals are mounted in polished aluminium blocks, the positions being altered in a few seconds by means of the adjusting screw. Spare numerals and dummy blocks may be ordered; tattoo ink is supplied in quantities as required.

[Illustration by courtesy of Taylor and Elliotts Ltd., Brisbane.

The body-tattoo instrument (*see* Plates 70 and 71) is a simple, comparatively inexpensive device for bodymarking pigs. The hammer head or that portion in which the letters or numerals are inserted is made of aluminium or nickel-plated steel; the tattoo needles are of similar type to gramophone needles, either pencil-pointed, grooved, or otherwise, according to style of instrument used. There is an adjustable screw to fix letter blocks in position, the handle being of hardwood or other material; the headpiece of the body tattoo is the heaviest portion of the instrument, this to provide weight and thus provide for better results in marking. The letters, symbols, and/or numerals used would, of course, vary in each case, the owner's brand or symbol always being used and a different numeral inserted for each lot of pigs marked. By the use of four or a complete set of blocks, a considerable number of combinations may be arranged for, thus enabling large numbers of pigs to be marked without duplication. A tattoo mark properly applied is sufficiently permanent to enable its use to be extended and to be included among the systems recommended where identification is compulsory or necessary.

This method of identification has been given extensive trial and has given general satisfaction, but the measure of efficiency is entirely dependent upon the care used in handling the instrument and the provision of a sufficient supply of suitable ink or paste. The quality of

the paste or ink used is most important. Of several preparations that have been subjected to experiment in Queensland, four stand out as being superior to all others.

Indian marking ink (blue or black).—This pigment, while slightly more expensive than the others, is probably the most efficient and adaptable, and in actual use is very readily applied.

"Zebra" stove polish in paste form has given excellent results; so also has "Zebra" liquid stove polish sold under the trade name of "Zebo."

Sherwin-Williams' black paint in oil has been used extensively by the proprietary bacon factories with satisfactory results, and is also recommended.

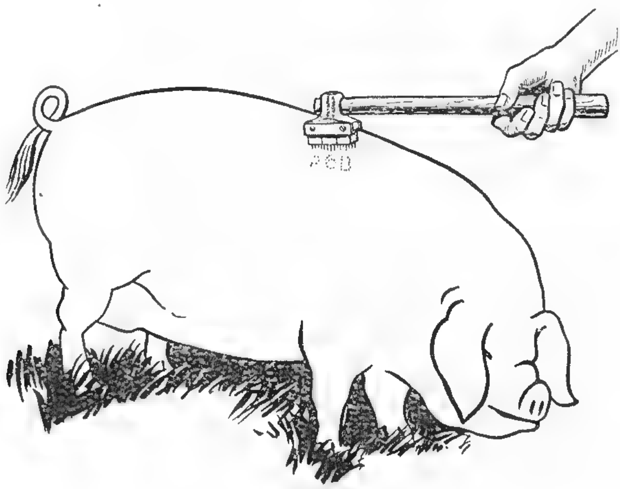


Plate 71.

Sold under the trade name of the "Two-Way Tattoo Pigmarker," this instrument is constructed to withstand hard and constant use. The headpiece is made of aluminium with steel-pointed needles, the wooden handle being adjustable for use in two positions—one permitting use in hammer fashion, the other with spear-thrust action. The illustration portrays a favourite position for branding.

[Illustration by courtesy of Smiths, Stamp Makers, Brisbane.

These preparations are readily procurable in country centres and are relatively so inexpensive there is no need to use any other. If not obtainable locally, they may be obtained from city firms, price varying from 6d. per tin of stove polish to 3s. 6d. per bottle of blue or black Indian ink.

In actual use it is necessary to have a soft pad or other container to carry the paste, paint, or ink, and to hold this in the hand or affix it firmly in a convenient position out of reach of the animals. When all is ready, the tattoo needles are dipped in the paste or ink, the needles being well covered; the pig is then struck firmly with the marker (*see* Plates 70 and 71). The best position on the body for the tattoo mark is on the shoulder just off the top and slightly below top of neck. A sharp blow is required in order that the needles will penetrate the skin, and after each pig is marked the needles should be again covered with paste or ink. Actually, although the needles are sharp and the

blow heavy, the pig does not experience much pain and apparently does not suffer injury, for it is very rare that even a slight bruise is noticeable after slaughter if tattooing is done properly.

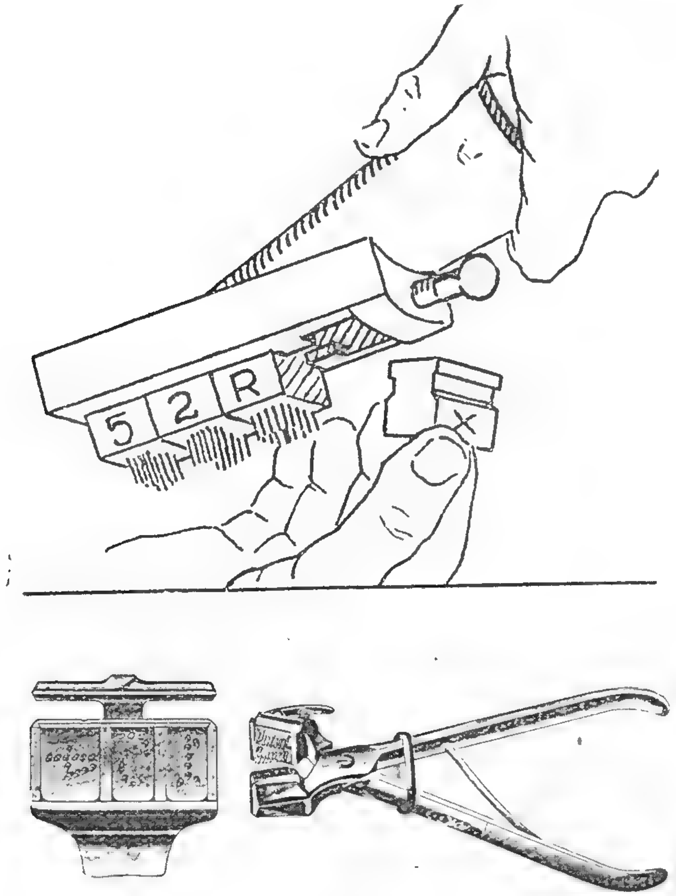


PLATE 72.

Illustrates method of inserting numerals or letters in body-tattoo instrument; also shows metal screw for adjusting position of blocks.

The lower figure illustrates the ear-tattooing device.

[*Illustration by courtesy of Taylor and Elliotts Ltd., Brisbane.*

It would be well here to again stress that this system of body-tattooing is not at present intended or recommended as a means of identification of live pigs—not even of white-skinned pigs. Its value lies in the legibility of the tattoo mark on the carcass; the ease with which the tattoo mark may be read; and the fact that its application does not result in disfiguration or any other objectionable feature. Again we stress that efficiency of tattooing as a means of identification is dependent upon—

(1) The efficient use of the tattooing instrument;

(2) The use of an instrument of a reliable type with strong, sharp needles;

(3) Taking time to do the job properly; and

(4) The use of a reliable brand of ink, paste, or paint.

When Marking should be Done.

As the Regulations under the Queensland Pig Industry Act throw the responsibility of identification on the vendor, whether he be farmer, agent, dealer, or manufacturer's representative, it is essential the pigs be identified before sale or delivery; thus the pigs should be marked on the farm prior to despatch or be identified by the agent (1) when being weighed over the scales at the railway siding or loading-place, (2) when being penned for sale, or (3) when received for consignment direct to factories. The Regulations also make it compulsory for those persons handling pigs to keep records. Section 11 of the Act provides for this as follows:—

> "Every agent, auctioneer, dealer, factory, or butcher shall keep a record in respect to every transaction in pigs with which he is concerned.
>
> "Such record shall include the date, the number, description, and distinguishing marks of such pigs, the name and address of the vendor, and the name and address of the purchaser, and such other particulars as may be prescribed.
>
> "Such information shall be made available to an inspector upon request by the inspector to the auctioneer, agent, or dealer, as the case may be."

Plate 73.

Showing handle of two-way tattoo in position for use where pigs are crated or in a position unsuited for use of the instrument as illustrated.

Illustration by courtesy of Smiths, Stamp Makers, Brisbane.

Where Marks should be Placed.

In all systems of identification it is essential that while being marked the pigs be confined in a small pen or race, or that they be marked in the vehicle in which they are to be transported (if such vehicle is convenient for the purpose). Where there is a lack of conveniences and the person identifying the pigs is inexperienced, it would be possible, in order to avoid duplication of tattoos, to attach a small pad soaked in ink or paste to that portion of the hammer head of instrument not fully occupied by letters or numerals, this merely to leave a paint mark on hair of the pigs as they are marked, for on black pigs in particular, when care is not taken, a pig may be marked twice in the same position unless some precaution is taken.

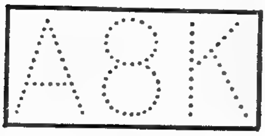


Fig. 1.

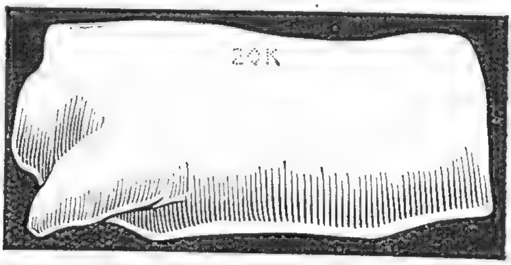


Fig. 2.

PLATE 74.

Illustrating style of identification mark resultant from use of the body tattoo.

[*Illustration by courtesy of Smiths, Stamp Makers, Brisbane.*

After the pigs have been slaughtered and dehaired the tattoo letters or numerals show clearly in the form of black dots (*see* Plate 74, fig. 2), such tattoo marks being legible even if the pigs had been tattooed several weeks beforehand. In body-marking of pigs with tattoos there is no necessity for any preparatory treatment of area on which tattoo is to be applied, except that the area should be clean and free from accumulations of mud. The instrument should be kept in a clean condition, and sufficient ink or paste must be used, otherwise results will be unsatisfactory. Farmers not conversant with this method should attend at pig sales where tattooing is carried out.

Regarding the cost of body tattoos, a complete set, including hammer head, handle, stamp pad, and sufficient paste or ink for marking 100 pigs, will vary in price from £1 to 25s., according to number of letters or numerals and quantity of ink or paste supplied. Names and addresses of manufacturers may be obtained on application to the Department of Agriculture and Stock at any time. If carefully handled, the one set of letters and numerals should be satisfactory for many years.

EARMARKING.

The branding or marking of individual animals in a herd is a matter of the greatest importance to the farmer, more particularly where the animals graze and roam over large areas and mix together

PLATE 75.

PLATE 76.

Showing operator using the body-tattoo instrument; note position approved for marking pigs.

one with the other, perhaps on properties adjacent to those on which other animals are kept.

No system of identification is considered perfect, but for identification of live animals both earmarking and ear-tattooing are practical and readily applied. It is of even greater importance that the brand or earmark be recorded in a suitable record book at the time that marking is done, otherwise the reliability of any system is weakened.

The earliest age at which an identification mark becomes necessary in pig-breeding is between one and two months of age. Where sows and litters have individual pens, two months of age or when the young pigs are weaned will suffice, or where castration of male pigs is carried out at six weeks earmarking could then be done. Every litter of pigs should be marked and correct records kept and recorded in the sow's farrowing and stock sales record book. Earmarking is probably the commonest and the most satisfactory method of marking for stud stock, but it has the disadvantage that when pigs fight or tear their ears on wire or barbed-wire fences, or where the ears are damaged in dehairing machines at the factory, this identification mark becomes somewhat unreliable. The operation of earmarking is performed with the aid of earmarking pliers, of which there are numerous designs. Earmarkers are known under trade names of Crown, Diamond, Fork, Spear, Pitchfork, Swallowtail, Thistle, Club, &c., all of which names are derived from the shape of mark made by the pliers. Allotment of earmarks and of position of marks on the ear is provided for under the Brands Act.

Pigs of all ages can be earmarked, but, as stated, it is preferable to mark while very young. Stud pigs should always be marked so that their breeding and ownership can readily be determined. Newly purchased pigs should be marked immediately they are brought into a stud to avoid confusion if they should become mixed with other stock or break fences and escape.

Earmarks are placed in different parts of the ear in accordance with position allotted when the earmark is registered. All the members of a litter should be marked with the same mark and recorded when sold or reserved for use on the farm, and all pigs sold, exchanged, or transferred should be marked with the registered earmark.

The cost of registration of an earmark for pigs under the Queensland Brands Act is 10s. Earmarking pliers for use in marking pigs cost between £1 and 30s., the price varying with design and size of instrument used. Earmarks should be registered with the Department of Agriculture and Stock, Brisbane; information on this matter can always be obtained from stock and dairy inspectors who are also inspectors under the Pig Industry Act.

In Queensland it is not compulsory to register brands or earmarks for pigs (although it is compulsory to identify the animals before sale), but if a registered earmark is used it must be placed in the position allotted to the applicant, and no other mark or brand is permitted on the same ear. Cuts in the ear representing sheep earmarks (which are used for identifying pigs) must be placed in the off or right ear of male pigs and in the near or left ear of female pigs in the position for which registration has been effected.

The earmarks must be read around each ear from the head, commencing at the front or top of the ear. All earmarks, of whatever kind, used in marking under the Brands Act must be made with pliers.

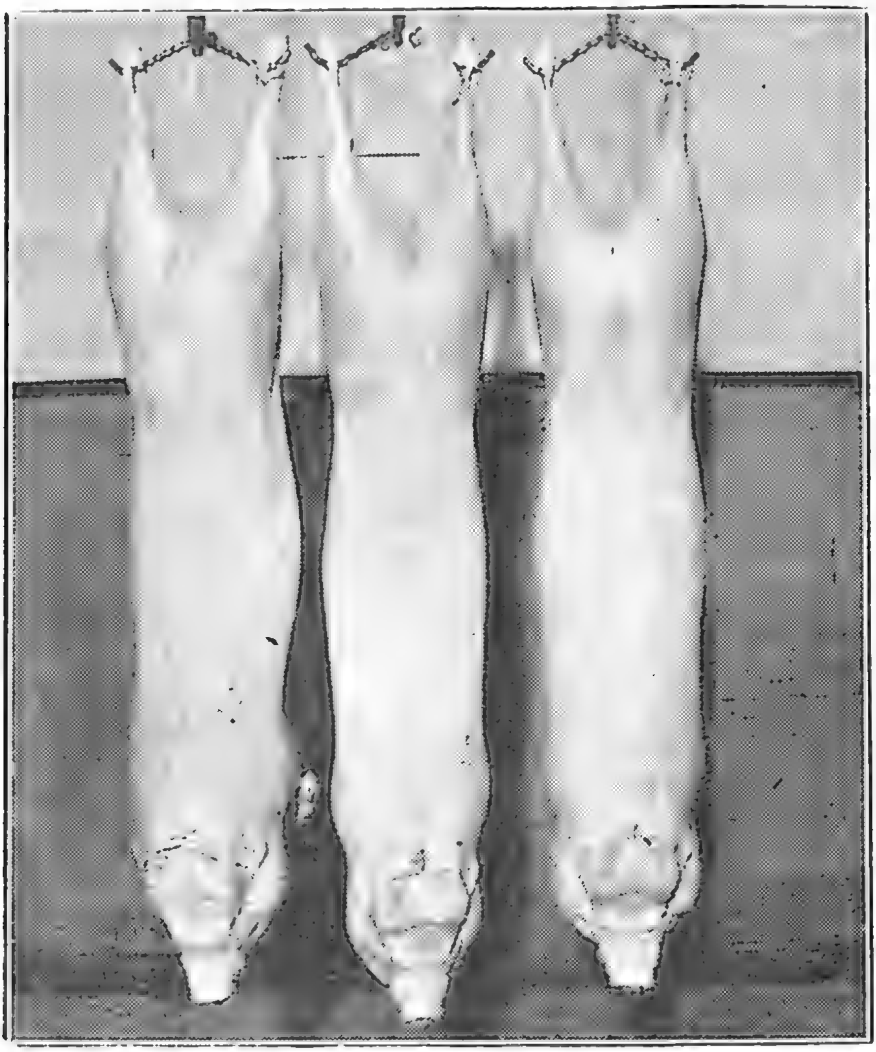


Plate 77.

Illustrating neat, attractive body-tattoo marks appearing on prize-winning porkers at the Royal Show, Toowoomba.

A sheep (or swine) earmark is defined officially as any registered mark or cut upon the ear of sheep or upon any goats or swine. A distinctive mark may also be used in marking the ears, and such marks may be registered. A distinctive mark is defined as any mark or cut, other than a sheep mark, which an owner is empowered to make upon the ear of sheep, goats, or swine to denote their age or class and whether registered or unregistered. Distinctive marks shall be made on the near or left ear of male pigs and on the off or right ear of female pigs. No provision is made covering the shape, design, or size of distinctive

marks, and any owner may use any number of distinctive marks to denote the age or class of his pigs, but such distinctive marks shall not be made on the same ear as the registered sheep earmark. There is no charge for registration of a distinctive mark, but a registered earmark is definite legal proof of ownership in the eyes of the law in case of stealing, whereas a distinctive mark carries no such advantage. The advantage of a distinctive mark, registered or unregistered, is that as an earmark it can be used to supplement a registered earmark being used on the opposite ear to that on which the latter mark is placed; thus such marks can be used in case an animal changes ownership several times during its life.

Care should be taken in using ear pliers in marking pigs—first, to see that the pliers themselves have been properly cleansed by being washed in a disinfectant solution; secondly, to see that the ear has similarly been cleansed, and also to avoid cutting into the larger blood-vessels near the edge of and towards the back of the ear. It is wise also to avoid cutting too close to the tip of the ear, especially in stud pigs, as the shape and carriage of the ears may be disfigured. In young pigs a small cut only is necessary. A word of caution is necessary *re* earmarking pigs, for at times sow pigs, in particular, become savage and may tear the ears of other pigs—young pigs particularly—and in this way may disfigure the ears. Such sows should be separated from the herd and be finished for slaughter, as they cause unnecessary loss, damage, and confusion. It is wise also to confer with the manager of the bacon factory or pork export works before deciding on an earmark so as to avoid duplication of marks.

Stud pig breeders in particular should register an earmark if an ear tattoo has not already been registered with the Stud Pig Breeders' Society; the latter being a private organisation, registration with them would not, of course, be officially recognised in a law suit, although such tattoo-marking is not objected to by the Department. When breeding sows are being marked, the mark should be recorded with the pedigree or record of purchase or birth. Additional particulars as to age, colour, any peculiar markings, &c., should be recorded at the same time to assist in identification if necessary.

If any doubt exists, farmers should immediately communicate with the Department, when suitable advice will be promptly despatched.

Ear Tags or Buttons.

The use of ear tags or buttons on stud animals when being transported by road or rail or shipped from place to place is to avoid risk of their being lost in transit, misdelivered, or miscarried. The tags, which are made of aluminium, may be initialled on one side with name, initials, or symbol of owner, and be numbered on the other. The principal objection to the use of ear tags is that they may be lost or, in the case of theft, may be replaced by another of the same type but with different lettering. All tags are subject to being pulled or torn out or to be crushed, mutilated, or disfigured to an extent as to be almost unreliable as a means of identification. If not properly inserted, the ear tag may disfigure the ear, and may even occasion a festering wound

around the tag hole, this especially so when the hole into which the tag is placed is too small or is jagged or when an unclean pair of pliers or unclean tags or buttons are used. The method of applying the ear tag by use of combination pliers is that one portion of the instrument is used to punch a hole in the ear into which the tag fits; the other portion of the pliers is to seal the tag to prevent loss. Combination pliers for use in punching holes for and for sealing ear tags are priced at about £1. Ear tags are sold at from 12s. 6d. to 15s. per 100, according to design, initials, &c. There is no provision in Queensland for registration of ear tags or buttons.

Ear-tattooing.

Members of the Australian Stud Pig Breeders' Society who breed Large or Middle White pigs are compelled by that organisation to use the ear tattoo for identification of their stud pigs, this method having proved to be sufficiently reliable for that purpose in white-skinned breeds. As with body-tattooing, the secret of success lies in careful application of the tattoo marks.

Tattooing has the distinct advantage that it is practically indelible; it only suffers by the inefficiency of the person using the instrument, or by the ears being torn or disfigured. In the case of stud pigs, it may be necessary to retattoo the ears as required if the mark becomes too faint. Care must be taken in tattooing the ears to see that both the ear and the instrument are perfectly clean before the operation is performed, otherwise septic troubles may result and a fibrous wart growth set up around the mark. Next to cleanliness, it is important that the needle blocks be firmly placed in the jaw of the pliers, as the animal may pull back suddenly when pressure is applied. The area to be punctured should first be cleansed by wiping over with a cloth soaked in methylated spirits (this removes grease); then the marking ink or paste should be rubbed on, and, after applying the tattoos, again rub in the ink or paste into the perforations made by the needles. Where pigs are to be tattooed with the owner's initials and a stud number also, one mark should be placed in each ear. The year in which the animal was born could also be placed in the form of a letter; thus in pigs the right ear could carry the owner's initials, and the left ear would show the year symbol and number, thus: A 365—i.e., pig born in 1934, number 365. In animals with a very heavy coat of hair on the ears it may simplify marking to first clip off the hair and then clean and apply the mark.

The Secretary (Mr. A. J. Tanner) of the Aberdeen Angus Herd Book Society of Australia states that in ear-tattooing of cattle of this black-haired breed blue Indian ink is used. Provided the veins in the ear are not punctured and that ample ink is used, good results may be expected. Mr. Tanner says the chief factor in using a tattoo is to thoroughly clean the ear before making a puncture and to rub the ink well in after using the pliers. Clean the ear with methylated spirits and use a good brand of blue Indian ink.

Tattooing marks properly applied cannot easily be removed, excision of the marked tissue being necessary to ensure complete removal.

Tattooing consists in "planting" black or coloured insoluble and non-absorbable matter under the skin so that the pigment becomes held or occluded permanently within the skin. Punctures of the skin are first made and the pigment introduced into the punctures. The puncturing presents no difficulty where suitable instruments are used, these latter being simple in design and construction. It is essential to stress the necessity for quick and efficient work in tattooing and the use and application of reliable brands of ink or paste, these latter having as their base carbon, lamp-black, and other indelible materials in solution or otherwise.

Ear-tattooing instruments complete with letters, numerals, ink, or paste retail at between 30s. and £2 2s., and may be secured from veterinary instrument manufacturers. The smaller size manufactured are best suited for marking young pigs.

Hair-clip Marking.

Marking pigs by means of clipping away the hair on any particular portion of the body is at best merely a temporary sale mark; so also is paint-marking and cutting of hair on tail (referred to as bang-tail). Paint-marks are useful once pigs are penned at an auction sale in order to differentiate between the animals and for reference purposes in sale of the stock, but they cannot be regarded as an approved method of branding under the Pig Industry Act. Both systems are useful in the hands of honest people, but a very strong objection to their use lies in the fact that an unscrupulous person could readily disfigure the mark and thus cause confusion and annoyance.

The objective of the Regulations is to pave the way for reliable methods of identification; hence as paint-marks, hair-clipping, and banging tails are not reliable as a permanent method of identification, they cannot be recommended. They would not be accepted as distinctive marks under the Brands Act, but if pigs are so marked at sale time the auctioneer should keep a strict record of such as provided for in section 11, referred to on page 161.

IDENTIFICATION OF GRADED CARCASSES

The Queensland Pig Industry Act provides for identification of all carcasses with grade stamps of a specified shape and size and of different colours according to how such carcasses are graded; such grade marks apply to all pork and bacon pig carcasses graded for sale within the Commonwealth. Grade stamp tags are attached to all carcasses intended for export as provided for under the *Commerce (Trade Descriptions) Acts,* 1905 *to* 1930.

Full particulars regarding these marks may be obtained upon application, in the case of the former, from the Department of Agriculture and Stock, William street, Brisbane, and for the export trade from the Chief Veterinary Officer, Department of Commerce, Q.T.C. Buildings, Petrie Bight, Brisbane.

The marking applied to bacon pig and pork pig carcasses for export consists of the word "Empire" in block letters, stamped on the hind leg, loin, fore-end (on shoulder), and hand and spring (foreleg).

Summarising these notes on identification, it may be said that it is advantageous in the interests of all concerned that all live pigs be branded by the vendor prior to disposal of the animals. It is essential that whatever mark is used it be used efficiently so that the animals are clearly and evenly branded. The next most important step is to advise the agent, dealer, buyer, or factory manager of the exact number, age, and condition of pigs, the marks given to each animal, and any other description that may be necessary to facilitate identification, and to be sure that the person concerned receives this information in ample time beforehand to enable identification to be carried out expeditiously on arrival of the animals.

POINTS IN PURCHASING STORE PIGS.

The following suggestions are offered to those who intend purchasing, or who regularly make a practice of purchasing, store pigs will not be out of place, seeing that a number of instances have been recorded within recent months in which unsatisfactory results have followed the purchases and money has been lost in the transactions. It is suggested that inexperienced persons who set out to purchase pigs for finishing for market should endeavour, wherever possible, to secure pigs not less than fourteen or sixteen weeks old, for it is disastrous buying pigs six weeks old or too young for weaning and expecting them to make progress or to prove satisfactory and economical, especially as these very young unweaned pigs often cost more at auction than those carrying more size and age. There is a wise old saying, "Never buy a pig in a poke," which literally means never buy a pig of whose breeding or development you know nothing. Fortunately, under the conditions on which pigs are offered for sale at public auction in this State, the buyer's name and postal address must be announced by the auctioneer before the pigs are offered for sale, but, though this is a valuable safeguard against the distribution of disease-carrying stock, it is not everything, and the buyers should certainly know something of the conditions under which the pigs intended to be offered for sale have been developed, the foods used in their production, the breeding, age, and any other information available. The purchase of store pigs from breeders with a well-known good reputation is usually a safe proposition, and it would be preferable to purchase only from well-known breeders if success is expected in the efforts to eradicate and/or trace disease to its source of origin. Lice, worms, and other parasites that infest the pigs are readily conveyed from one animal to another, and there is some evidence that they are responsible for the spread of disease.

When selecting pigs from a litter, secure the strongest and best; they will repay the extra cost of two or three shillings per head and prove to be good buying; the same may be said of purchasing stock that are already making good progress. Never buy pigs manifestly unhealthy and with abscess formation, ruptures, piles, open or suppurating wounds. It is wise, where possible, to have the stock or dairy inspector make an inspection of the pigs it is intended to purchase before the sale commences or the deal is completed, in order to have an additional safeguard. It is wise to avoid purchasing pigs which are in poor, emaciated condition and/or are stunted in growth and which give evidence of unthriftiness. Avoid purchasing where the pigs are crowded together in a small and possibly a badly lighted pen.—E. J. SHELTON, Senior Instructor in Pig Raising.

Some Notes on Silage

WITH SPECIAL REFERENCE TO STACKS.

By H. C. QUODLING.

SILAGE stacks suffer deterioration if an attempt is made to hold them over from season to season. Best results are obtained by building them at the latter end of Summer, in the flush season, and using the fodder in the Winter or Early Spring.

It is evident that the dairymen and sheep farmers of our agricultural districts will never come into their own until their stock can be satisfactorily carried through the winters and over any dry spells which may occur.

Increased land values, and a general all-round rise in the cost of living and, similarly, in that of production, may be cited as reasons for keeping stock in condition and in a state of efficient productivity consistent with ruling conditions.

Cultivated crops and artificial pastures are doing much in effect, but seasonable shortcomings can only be met by looking to the contents of the barn for dry feed, and to the silo or stack; in this latter instance is to be found a palatable, ready-to-hand form of succulent fodder, which should be provided on every farm where live stock are kept for profit. Many arguments may be advanced in favour of silage, but it is felt these are not required where practical thinking men are concerned, whose chief inquiry is for reasons to prove to their intelligence that, by adopting certain methods of conserving fodder, they are to get a *quid pro quo* for their outlay, be it in labour or in kind.

Queensland's rich soils and generous summer rainfall are responsible for crop growths not attainable in the more temperate parts of the Commonwealth; and when such tangible results are to be so easily secured from Nature's garden, it is certain that a stockowner's desiderata in the matter of a supply of the right class of fodder will be readily attained by an extension of the self-help methods common to all who have to wrest a living from the land.

Inquiries through the medium of the Department on silo construction and its attendant features are sufficiently numerous to indicate that interest has been aroused in the subject of fodder conservation.

It is not proposed here to dilate on the merits of different silos or advocate possibly out-of-reach methods likely to act as a deterrent on account of an initial outlay of capital, but rather to deal only with a section of the subject with simple and economic features designed to meet local and existing conditions.

A number of silage demonstrations have been carried out by Departmental officers, and, although evidence in a general sense is not wanting to show the possibilities of fodder conservation, it is more fitting that the words of those farmers who have followed out the methods advocated may be made known to others who contemplate erecting silos or stacks.

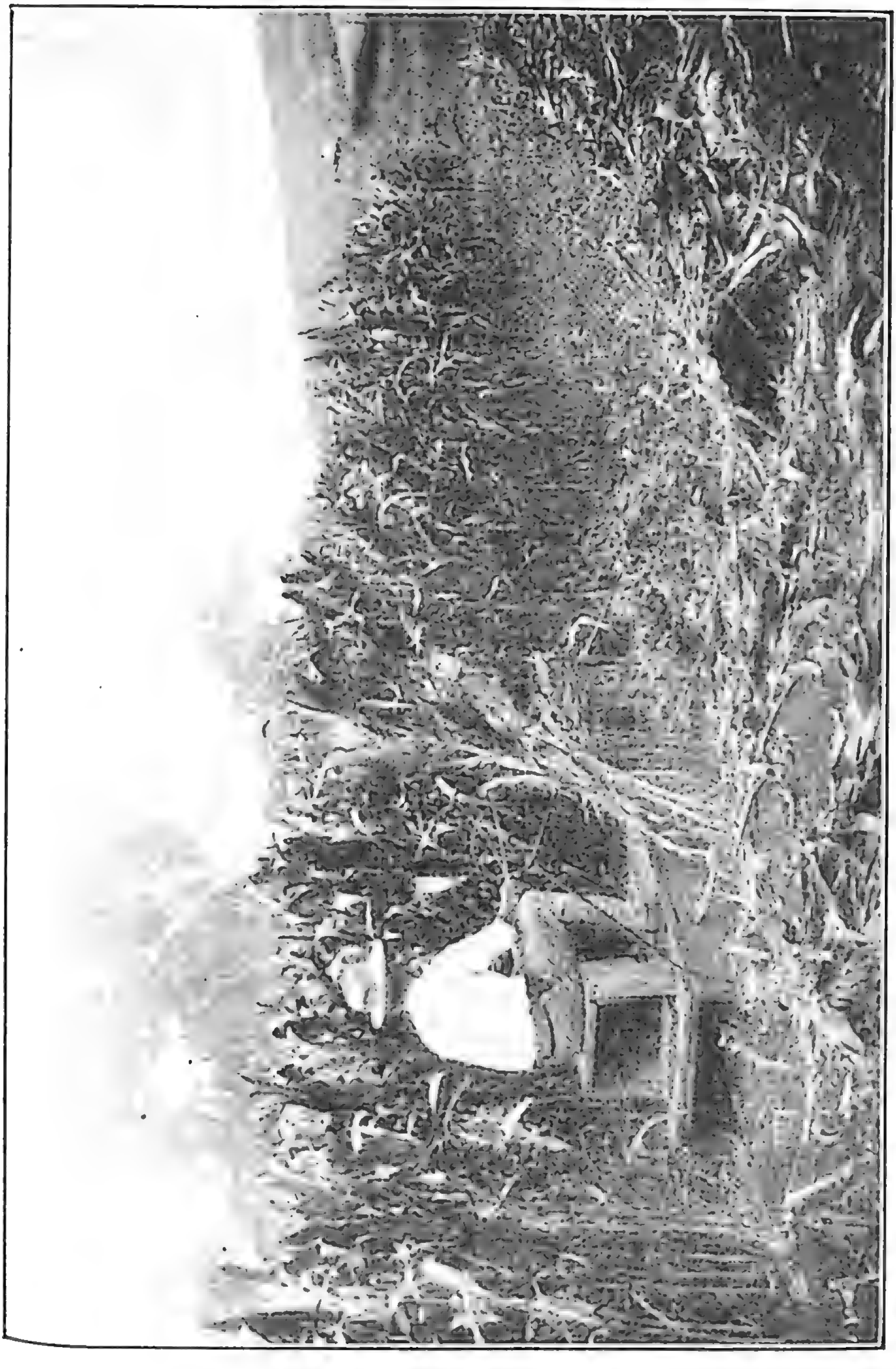


PLATE 78.

Sledge cutter at work in an immature crop, showing manner in which stalks are laid down by means of guide rod.

Extracts from their manuscripts are as follows:—

"The stacking of maize was finished on Saturday, 3rd May. All are well pleased with the way the lever worked. It was rigged up so that the bundles were slung right over the side into the middle of the stack, and the earth for weighting (6 tons) was put up in the same way. We started feeding the silage to the cows straight away, and they took to it greedily, and are showing an increase already, so we are reaping the benefit of stored fodder."

"The ensilage is very good, and the cows would tear the stack of maize down to get at it."

"I think the method of stacking all that can be desired—that is, when one cannot afford to build a silo. It opens up splendidly, in my opinion, with very little waste, and stock eat it readily, notwithstanding that we had to cut the crop (maize and sorghum) on the green side, on account of being afraid of frost. The cows chase the dray as soon as they see it, and milk well on the fodder."

"It has been the means of storing from 100 to 160 tons of silage (sorghum and maize) which might otherwise have been spoilt."

"In 7 weeks after stacking, I commenced to use the silage, and came to the conclusion, in a very short time, that I had a valuable asset from a feeding point of view. I fed in boxes at the rate of 40 lb. per diem per cow, and cows which had been in milk from 4 to 8 months increased their flow fully 50 per cent. Cows which have newly freshened keep up their normal first flow unceasingly, and that during winter. It is better to feed after milking than before, and I am at present obtaining an A1 grade from the factory for my cream. . . . am well satisfied with the experiment, and have come down to the bed-rock conclusion that, as soon as funds will permit, I will erect a silo, as, after some years' experience, it has been found that one cannot 'dairy' in the winter on artificial grasses with profit, and ensilage appears to be a *par excellence* winter ration. The sorghum ensilage is chaffed with a small percentage of sugar-cane, in order to carry it through the chaffcutter, as it is not the best stuff to chaff by itself."

"Maize and sorghum were sown in alternate rows. Owing to dry weather, there was only a light crop; a reaper and binder was used to cut the crop, and the carting was done with rough sledges, each drawn by one horse; stacking began on 26th March, and the stack was opened in the second week in July. After cutting down the first bench of about 9 in. as waste, it was found to be in good condition. The cows did not take to it at first, but the calves ate it well. One by one, however, the cows began to eat it, and now nearly all of them are feeding on it, some of them taking it greedily."

"We are milking 22 cows, and it is a significant fact that a pronounced increase in the milk yield has followed. As they have no other change of food, I can only attribute this increase to the silage. As the feed* in our paddocks is now becoming

* Principally Rhodes grass.

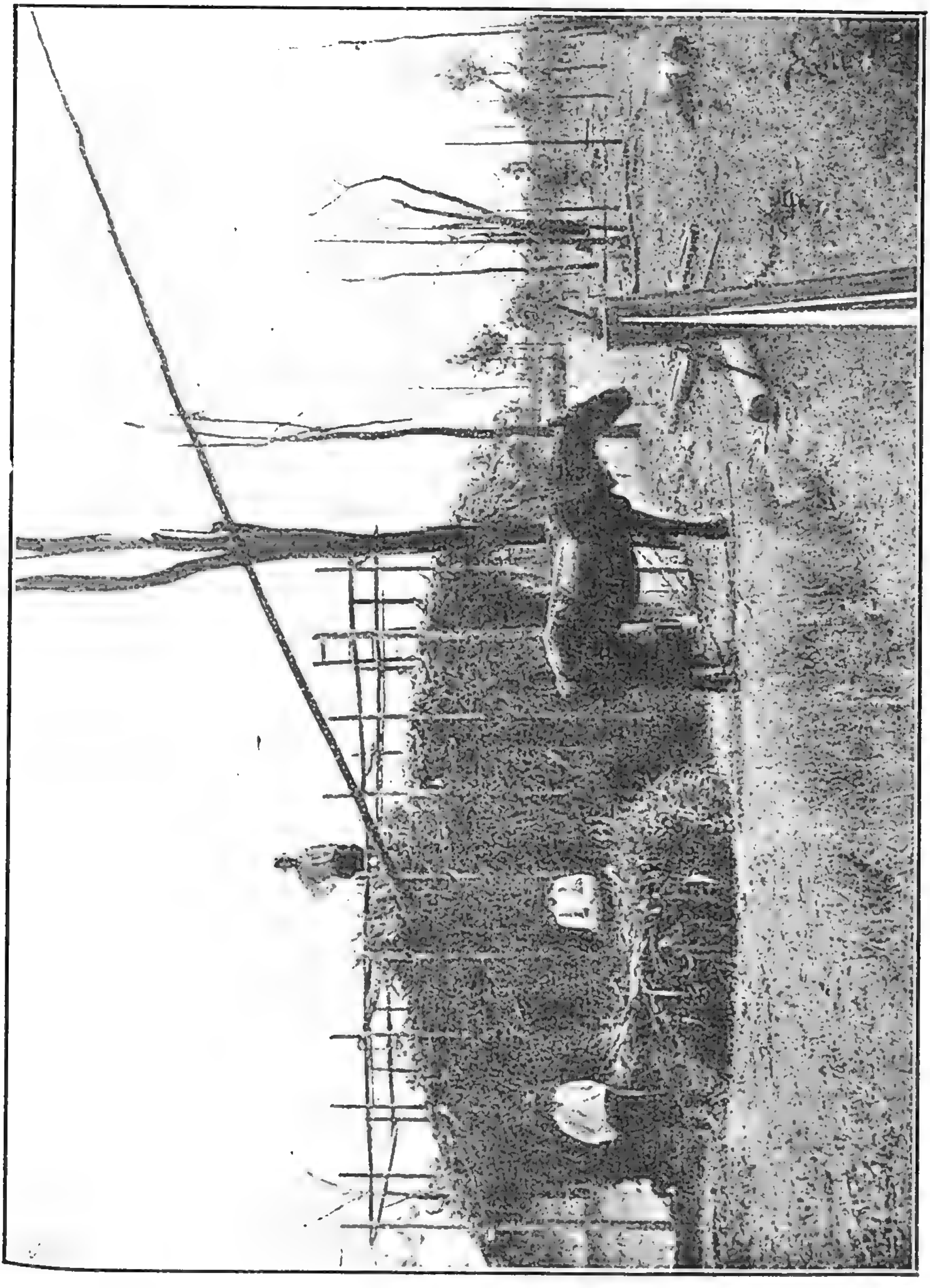


Plate 79.—Stack in course of construction, showing projecting "untrimmed ends," also "whip" hoist attached by means of a chain to a dead tree.

poor, and there is little prospect of its improving for a month or so, I view the silo, with its stock of compressed fodder, with great satisfaction, as I believe it will tide our dairy herd over the critical period of the year. This is its great value, and I more than ever see the wisdom of having laid by this winter store of food. During the coming summer I shall build a much larger stack on the same pattern, and hope to put by 70 or 80 tons of maize and sorghum for the winter. I assure you of my complete satisfaction at the result of your experiment on my farm."

"Am very well satisfied with the experiment and will build a considerably larger stack next year, all being well. I am not using up to the full amount, but what I am is keeping my cream and milk supply up to its regular amount; other hay, such as lucerne, oaten, and, at times, bush hay is mixed with it. My cows, when it was first offered to them, did not seem to care about eating it, but now they have got used to it, they nearly go mad to get at their feed."

"I opened one end of the stack to see what it was like, and am glad to say it is first class. I am perfectly satisfied with the experiment, and intend going in more for it in the future. When stacking was finished I put in 18 inches of earth on top, sloping from centre of stack to the ends; then five wires across the top and hung very heavy logs to them; two persons who have examined the stack, and know stack ensilage in other parts, state that it is in excellent condition."

Instances are not uncommon where maize crops have made good growth up to a certain stage and then failed to set grain through the dry weather. In the Southern Burnett part of the 1916 crop was affected in this way. Altogether about 50 stacks were erected in this locality alone, some ranging to 150 tons capacity.

Again in 1919 officers of this Department held demonstrations in silage making, and travelled through several districts with the object of assisting and advising farmers who were determined to turn their wilted crops to good account for fodder purposes, upwards of 12,000 tons of fodder being conserved, which assisted in saving the lives of many valuable dairy stock.

Inquiries made since show that the silage was found to be or great value and of satisfactory quality.

Points to be Observed.

Maize is one of the best and most satisfactory crops to grow, but any ordinary crop which is commonly used for green fodder or hay will make good silage.

The amount of labour involved in the handling of bulky green fodders may be considerably reduced when machinery is available for cutting and for binding into sheaves.

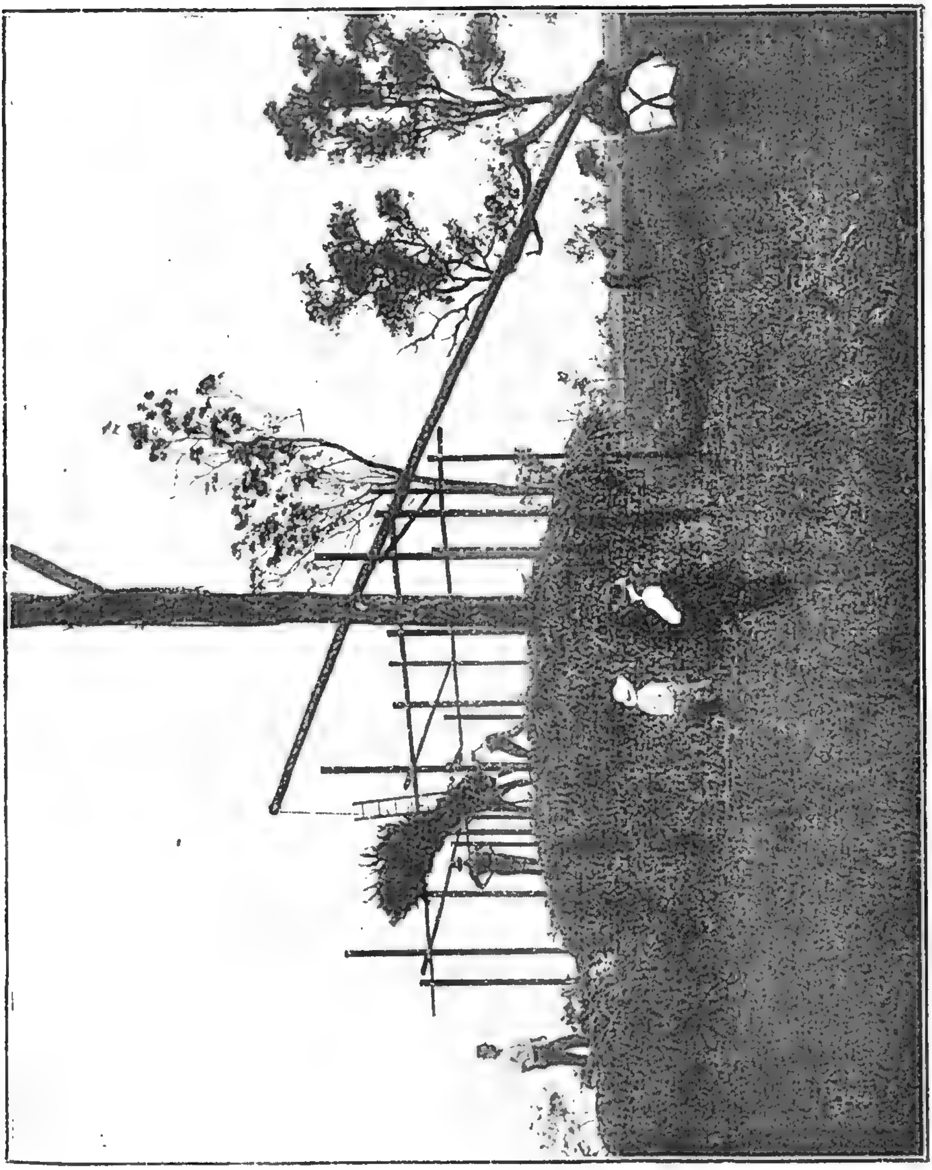


Plate 80.
Stack silage demonstration at a dairy inspectors' special silage instructional course.

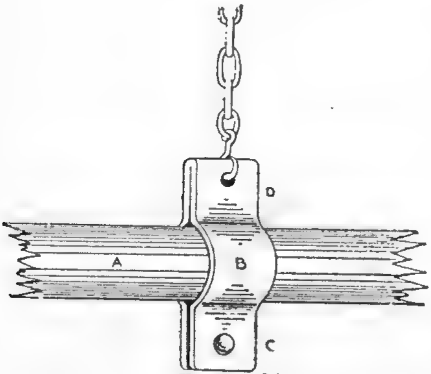


PLATE 81.

CLAMP FOR SUSPENDING WHIP.
(a) Whip spar.
(b) Clamp made from an old tyre 4″ × ⅝″.
(c) Clamping bolt.
(d) Clamp welded and bored for hook.

Where large quantities of fodder are to be handled, a mechanical hoist is required for the higher levels of the stack. For hand work the "whip" type is preferable. In connection with the erection of a "whip" it is necessary that some means be adopted to prevent the spar slipping at the point of suspension, and the clamp shown in the sketch is an effective and useful means of preventing this. A substitute which is also very effective may be obtained by using an ordinary chain strong enough for the purpose and forming a "clove" hitch at the point of suspension, afterwards nailing on two small hardwood blocks to the "whip" spar, one above and one below the position of the chain on the spar; or drive in two strong iron staples. For horse power a yardarm and spar, with suitable blocks and the necessary wire rope and clutching dogs, make an effective combination, or pulleys and tackling may be substituted.

Fodder stacked in the open is subjected to an atmospheric pressure of 15 lb. to the square inch; and the stacker's chief concern should be to check combustion as much as possible—*i.e.*, by preventing the access of air to the mass.

Waste is unavoidable at ends and sides and is to be expected. A 25 per cent. depreciation will take place under indifferent conditions of stacking. The loss under good conditions should not be more than 12 per cent., provided attention is given to salient features and to working detail.

Coarse or fairly mature fodders require a greater dead weight pressure, and do not compact as readily as finer and more succulent plants.

Emphasis is placed on the fact that the success of a silage stack depends very largely on the consolidation of the contained fodder so as to exclude air, which, if admitted, would cause rapid deterioration.

"Use plenty of weight when stack is completed."

Variations in temperature are factors in the chemical and biological changes which take place in the process of turning a mass of green fodder into silage, but it is unnecessary to go to any more trouble than to check the processes of oxidation and fermentation which are responsible for high and abnormal temperatures. When undue heating takes place during the process of stacking, the temperature of the mass is readily reduced by putting on more green fodder, and by throwing a series of wires across the stack and hanging heavy logs to them; this may be done at the close of each day's operations. Where a limited number of animals are kept, long and narrow stacks are preferable, as the lesser superficial surface is exposed at the ends when feeding out. The higher the stack, in keeping with facilities for hoisting, the better.

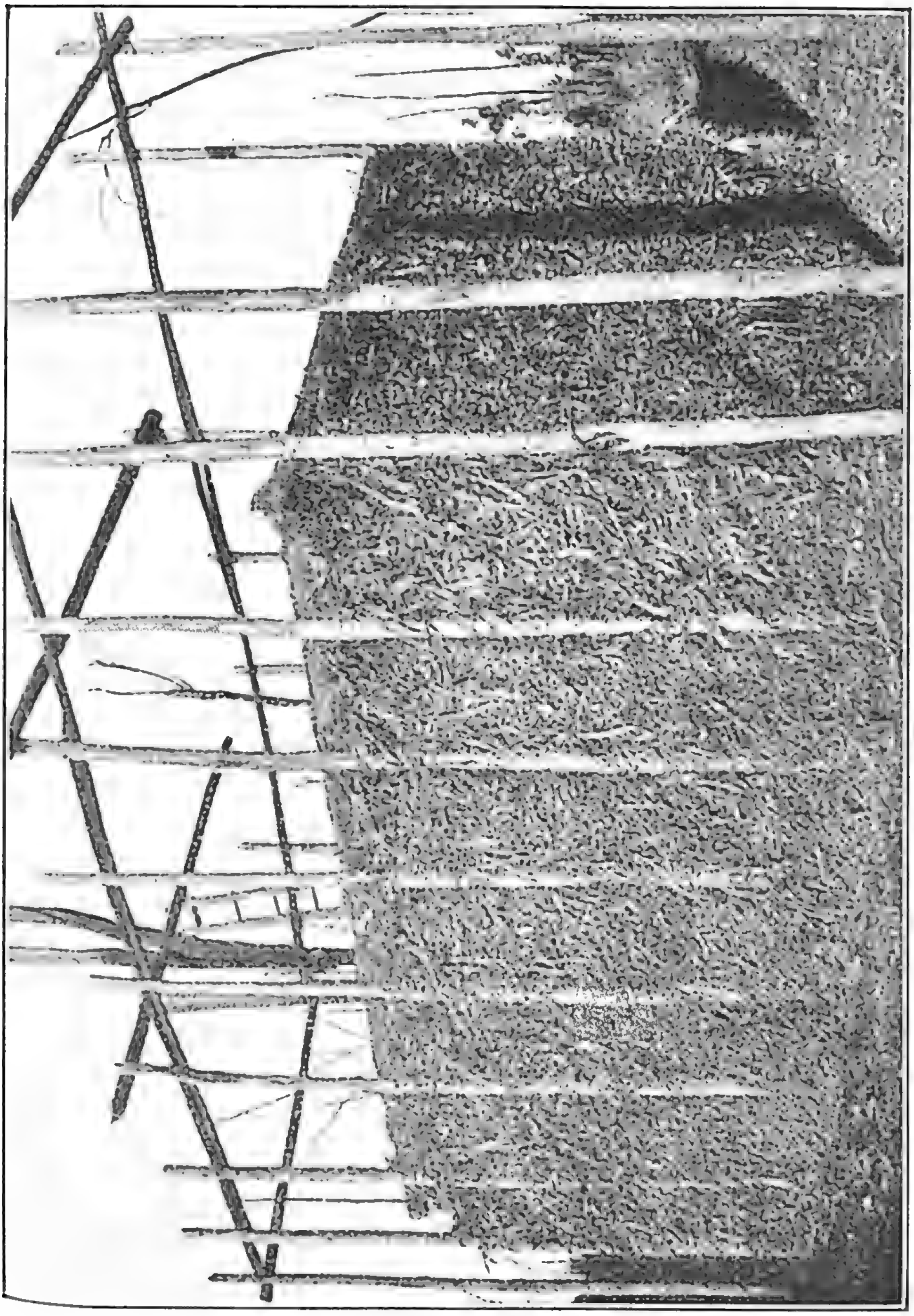


PLATE 82.—Framework and "trimmed" stack, showing an extra pair of uprights at each end, to which a crosspiece is attached for supporting the ends of the fodder when stacking.

It takes from 50 to 56 cubic feet of consolidated silage to make a ton. Crop yields may be computed and the dimensions of frame work arrived at. Abnormal settlement is to be expected, and weighted stacks usually settle down finally to a little less than two-thirds of their original height.

Heavy crops like maize and sorghums should be evenly sown in regularly spaced drills to facilitate harvesting by machines; the production of a medium thickness of stalk with a maximum of leaf should be aimed at.

Immature crops produce a less palatable and inferior article from a feeding standpoint. Where maize is to be chaffed into a silo, the crop may be left standing until the plants acquire the most nutriment—*i.e.*, when the grain attains the soft dough stage.

For stacking, it is an advantage to cut when the grain is in the "milk" stage before the stalks become too firm. Sorghum, Japanese millet, panicum, &c., should be cut when the seed heads or panicles are well formed and the grain about half developed.

The Stack.—The site should be chosen on a naturally drained piece of ground, and handy for feeding out to the stock, and yet as close to the crop as it is possible to get it.

When computing prospective contents of stacks several factors require to be taken into consideration, amongst which are—

Material used for silage;

Condition of crop at time of cutting;

And the amount of dead weight to be subsequently added to consolidate the stack.

Sorghums and millets are inclined to pack tightly and afford, on this account, a heavier average weight to the cubic foot than maize.

The following table of contents of various sized stacks may be taken as approximate; sorghums and millets, as previously mentioned, will weigh somewhat heavier:—

(At rate of 54 cubic feet to ton.)

SIZE OF PERMANENT STACK AFTER ENDS ARE TRIMMED.

Feet.		Tons.
12 × 9 × 15	=	30·0
12 × 10 × 15	=	33·3
15 × 9 × 15	=	37·5
15 × 11 × 15	=	45·8
18 × 10 × 15	=	50·0
18 × 12 × 15	=	60·0
21 × 12 × 15	=	70·0
21 × 14 × 15	=	81·6

In setting out a frame for a stack 18 ft. by 10 ft., ten poles on each side would be required, arranged as follows:—

Poles require to be 17 ft. 6 in. in length, and about 5 or 6 in. in diameter at butts. Sink the holes 20 to 24 in. in the ground. Top plates and tie beams should be securely twitched on close to the top of uprights, to make the framework rigid.

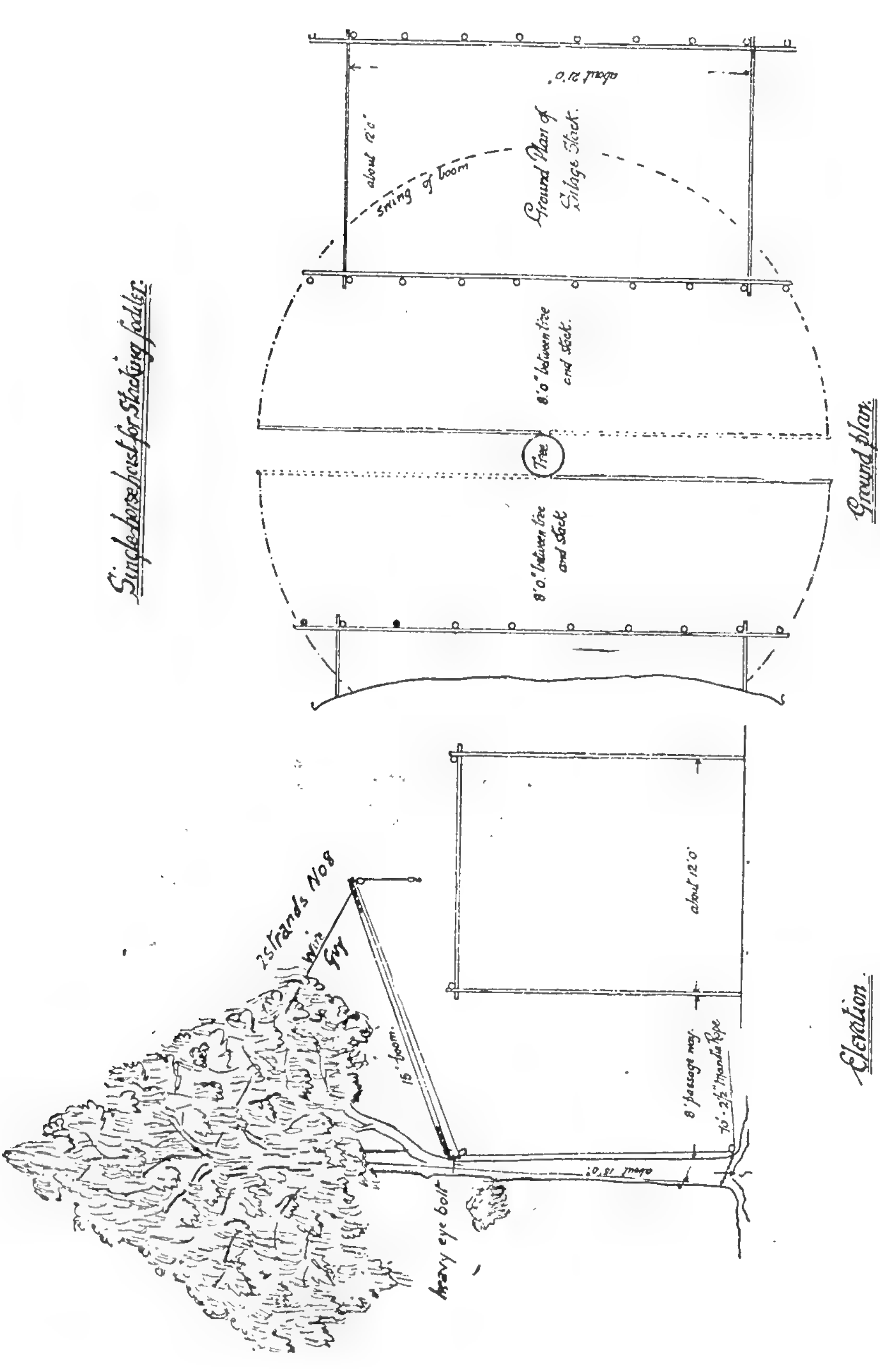

Single horse hoist for Stacking fodder.
swing of boom
about 12'0"
about 21'0"
Ground Plan of Silage Stack.
8'0" between tree and stack.
Tree
8'0" between tree and stack
Ground plan.
2 strands No 8 wire guy
15' boom
heavy eye bolt
about 18'0"
8' passage way
70'-2½" Manila Rope
about 12'0"
Elevation.

PLATE 83.

When long-stalked crops are to be stacked, a fair average distance apart to place the uprights is 3 ft.; for shorter-growing crops this distance should be lessened accordingly.

Construct a framework of bush poles similar in design to those in accompanying illustrations, the dimensions of which and distances between the uprights being arranged so as to accommodate the amount and class of fodder on hand. Plant the poles firmly in the ground; attach the top plates with a wire twitch at a height of, say, 15 ft. from the ground. Brace across at ends and at centre, taking care that the pair of poles intended for carrying the central brace or tie are carried up high enough to give head room for the stacker when moving about on the upper levels of the stack.

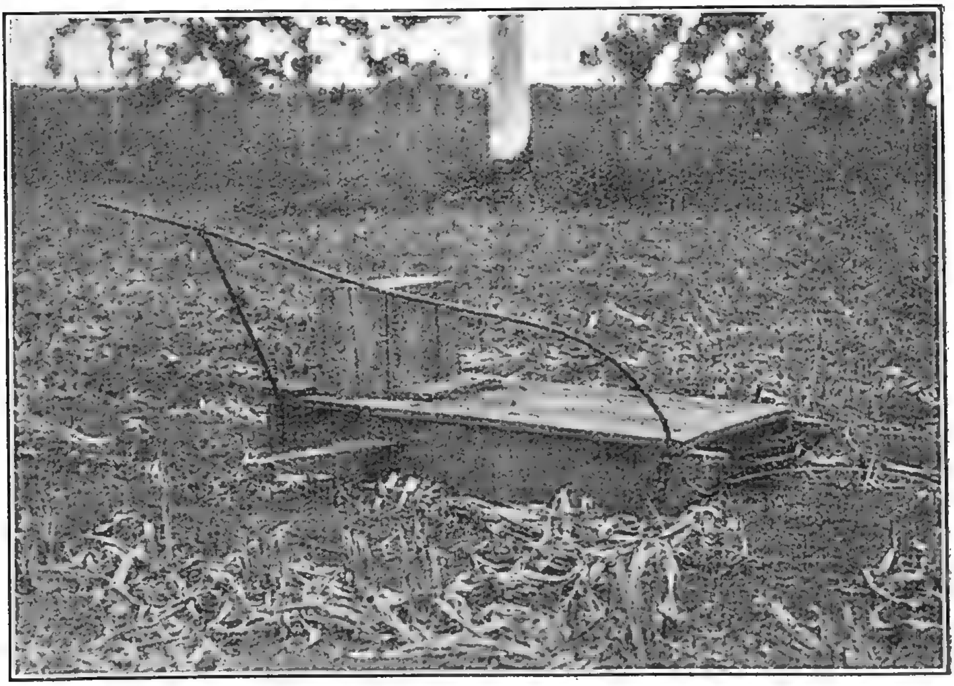


PLATE 84.

Sledge cutter 5 feet 6 inches long by 2 feet 4 inches wide, showing projecting scythe blade (passed through mortice), also angle to set guide rod.

The uprights may be spaced at a distance apart of 3 ft. along the sides for maize and sorghums, and a minimum of 2 ft. for crops like barley and panicum. An extra pair of uprights should be put in at each end of the framework and braced securely; a crosspiece is attached to these to carry the projecting ends of the fodder until such time as they are trimmed off, the crosspiece subsequently being moved higher up to serve a similar purpose.

The position of that portion of the top plate, proving to be in the way for the "travel" of the whip, may require to be altered temporarily, or brought down to a lower level, and afterwards raised as stacking progresses.

The framework is of no value once the stack has settled down.

The "corn binder" is the most approved machine for cutting and binding maize and similar strong-growing crops into sheaves.

Plate 85.
Stack built under the supervision of the Department of Agriculture and Stock.

Lighter classes of crops may be handled to advantage with an ordinary "reaper and binder" or back-delivery "reaper."

The secret of handling heavy crops is to keep the stalks parallel in the bundles, whether cut by machine or by hand.

Maize and sorghums, if standing fairly upright in the drills, may be cut with a sledge cutter, which is simply a narrow sledge, set on a pair of runners and decked with 6 in. by 1 in. boards—a scythe blade is attached at one side at an angle adapted for slicing off the stalks, and should be braced in such a way as not to interfere with the cutting. Fix a guide rod to lay the plants down evenly in a regular swarth. They can then be kept fairly parallel when gathering them into bundles. For hand work an ordinary cane knife is very suitable.

Sledges are the handiest for short hauling distances; when the "hoist" is used, the fodder should be loaded on to suitably sized rope slings to be ready for lifting off.

Before commencing to stack, open out a shallow drain around the outside of framework, and use the soil for levelling off any surface inequalities within it. Place a layer of about 6 in. of waste green grass on the ground. Start stacking on this and KEEP ALL THE STACKS LAID THE ONE WAY. Transverse layers admit air far too much into the stack. Place the tassel end of the maize at least 3 ft. 6 in. over at both ends of the stack. When placing down the next layer, reverse the order, and if the fodder is at all on the dry side, damp it with water, and take the precaution also of placing some of the leafy portions of the fodder over any bare patches which may be present. When a height of about 3 ft. has been reached, lay down a board flush with a pair of uprights which are to form the true ends of the stack, and trim off the projecting ends of the fodder. Before starting to stack again, move the crosspieces up the outside pair of uprights, in order to support the ends of the second tier of fodder. Repeat the process of stacking and trimming off as previously noted.

A minimum thickness of not less than 2 ft. 6 in. of fodder should be stacked each day.

Keep a good camber in the centre of the stack, as heating soon causes abnormal settling there. Use judgment when binding the layers back, so as not to have any bumpy joints where the laps come. Care should be exercised in placing fairly straight stalks along the sides, and these should be well firmed down between each pair of poles, the laps being carefully watched to prevent any spaces being left.

The trimming of the ends, which should be done with a plain hay knife, ensures a consolidated section exposed to atmospheric influences, but the carefully concealed over-lapping of the stalks at the sides is essential for keeping the air from penetrating the mass; the more the air is kept out, the smaller the percentage of loss.

Settling takes place rapidly as soon as the mass begins to heat.

As previously noted, wires, heavily weighted, should be thrown over the stack at night time, attention being paid to the placing of separate wires within a few inches of each end of the stack where it is trimmed off. Remove wires and weights before continuing to stack next morning. Allow a big margin for settling. When finished to a full camber, spread

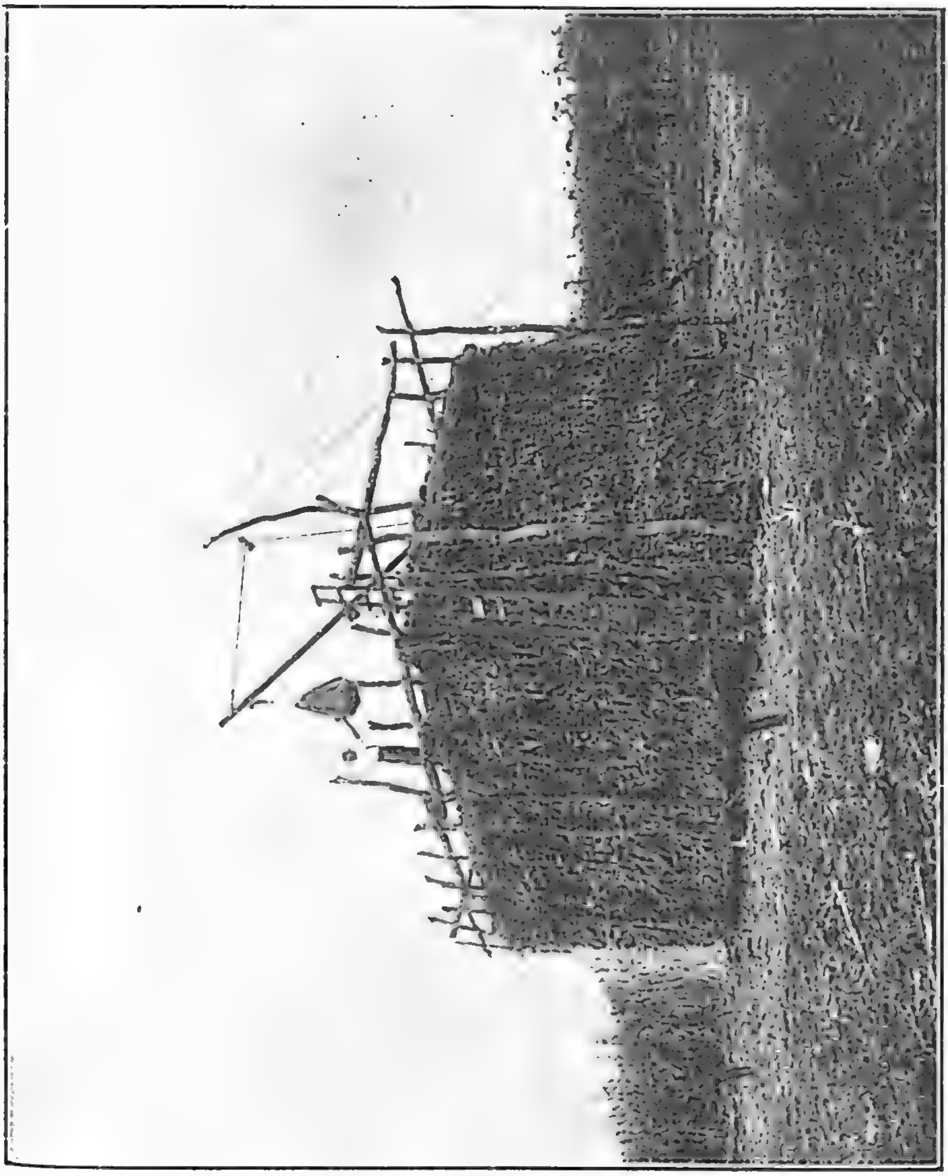


PLATE 86.

A stack nearing completion. Weighting material (stones) being hoisted by a horse prior to the topping off of stack with bush hay.

a layer of several inches of soft green grass or other close-textured weeds immediately on top of the silage; water this well. A framework of logs should then be placed evenly on top of the completed stack; these should be halved at the ends in a similar manner to the ground plates of an ordinary building. The weighting material is evenly disposed over the whole surface of the stack, the logs keeping the loose soil, or any other kind of material used to supply the weight, in its place. The layer of soil must average about 12 in. in thickness. The stack should then be topped off with bush hay or other waterproof material. A neat finish should be given to the roof, which requires to be built to a full eave, and all loose straws raked off. Wires are then placed across the top, and well weighted in order to keep them in position.

Other Weighting Material.

Stones, where they are easily procurable, may be substituted for soil, and the spaces between the stones can then be filled, if so desired, by soil.

Permanent weighting material is readily prepared by filling kerosene or benzine tins with concrete or with cement and sand compo., twisted wire handles being inserted in the mixture before setting takes place. This latter system economises labour where silage-making becomes a regular institution on the farm.

Although it is an advantage to allow the stack several weeks in which to settle down, and afford the necessary time which is required to effect the metamorphosis "from green fodder to silage," it may be opened at once should the fodder be then required. All that is necessary is to throw off some soil at the extreme end of the stack and cut down a narrow bench from top to bottom. The covering of soil on top keeps the rest safe from the weather.

Stacks are not meant to last more than a few months on account of depreciation from exposure to the weather, but instances have occurred where they have been kept for years, and then used to advantage. (Silage will keep, however, for many years in a well-built silo, and the depreciation is infinitesimal.)

Better results are obtained by chaffing the silage before use, and its passage through the chaffcutter is facilitated by using any strong-stalked fodder to assist in carrying it through.

A handy method to provide for feeding out to animals is to make receptacles, to act as makeshift troughing, out of ordinary 4-bushel sacks strung on No. 8 wires. Pairs of round uprights are put in at opposite ends of a line of fencing, the character, length, and gauge of which are designed to carry the sacks strung out on or sewn at each side to No. 8 fencing wires, running parallel to one another and placed at such a width apart as to form the suspended sacks into receptacles of the desired depth. Crosspieces may be nailed to a series of pairs of intermediate posts, and the holes for the wires bored through these to suit. The same class of feeding receptacles may be used for sheep, but should be made narrower and kept at a convenient height from the ground for feeding.

Brief Notes on Silage as Food.

"Silage is not a perfect food, and must be supplemented by other fodders and concentrates where full milk production is looked for."

Plants like maize, sorghum, and similar fodders, which contain a relatively high proportion of carbohydrates (starch, sugars, &c.) used in an animal's system for maintaining bodily heat, do not form perfect foods until more protein or flesh-forming substances are added in proportion, recognised as suitable in the aggregate, for making up a balanced ration. Leguminous plants—lucerne, cowpeas, field peas, &c.—are designed by Nature to supply this deficiency. In practice, it is found that the succulence of silage assists in the assimiliation by animals of dry foods and cured fodders.

A good combination of food for one day, sufficient for the support of one cow of 1,000 lb. weight, when yielding up to 3 gallons of milk, is arrived at by feeding 45 lb. of maize silage and 15 lb. of lucerne as hay or chaff; another ration, equally suitable, but not quite so rich, may be made up by using 40 lb. of the former and 20 lb. of cowpea chaff. The nutritive ratios of the fodders noted work out at 1 : 4·73 and 1 : 6·16, respectively. Analyses of fodders and silage present many variations. A general average per head per day for the support of a number of milch cows, when other feed is scarce, may be set down at 40 lb. of maize silage and 15 lb. of lucerne chaff. With this as a basis, the feeder is in a position to use his intuition and judgment in dealing with the individuality of animals.

MILLET HARVESTING.

Judgment must be exercised in deciding the time at which to cut millet for forage, and for all purposes care must be taken to harvest at the correct period. This should be the stage at which the crop is richest in nutrients, and most palatable and digestible.

When the majority of the seedheads or panicles have formed in the green pendulous stage is the correct time to cut for green fodder. It is better to err on the side of greenness, though millet cut too green has a laxative effect on stock; if too ripe there is a possibility of the feed becoming unpalatable.

The green crop contains much moisture in both stalks and foliage, and in consequence takes longer to cure than ordinary wheaten hay. If the crop is intended for silage, it may stand a little longer after heading out, but it must be cut prior to ripening.

As green feed, hay or silage, millet is very useful for dairy cattle, sheep, and young stock. For grazing it has been found to be excellent for sheep and cattle. Millets have no poisonous qualities, like sorghum, and may be fed when quite young. It is best, however, not to start feeding off until the crop has attained a height of at least 6 inches. After it has been well eaten down the stock should be removed until another growth is made. With suitable weather conditions, this should be only a matter of days, as the growth is rapid.

Japanese is by far the best variety for feeding off.

There is no more useful crop than millet as a quick-growing source of feed. It may be sown up to the end of February.—A. and P. Notes, N.S.W. Dept. Agric.

By H. W. BALL, Assistant Experimentalist.

IN view of the numerous inquiries reaching the Department of Agriculture dealing with what is commonly known as sorghum poisoning, it is evident that considerable confusion exists among the farming community as to those plants most liable to cause fatalities among stock.

For instance, millets are often mentioned, although the millets, including those varieties known as Setaria and White Panicum, do not contain any poisonous substance and may be grazed with safety at any stage of their growth. It is the sorghums which contain a hydrocyanic acid-yielding glucoside which is chiefly concentrated in the stalks during the early stages of growth. This HCN persists in decreasing quantities as the plant grows, entirely disappearing by the time maturity is reached. Stock should therefore not be allowed access to immature sorghum, especially if wilted through dry weather. Second growth and immature frosted material is also dangerous. Sorghums are most palatable and nutritious when the grain is in the milky stage, which is therefore the most opportune period at which to cut for silage or fodder purposes.

Sudan grass, which is classified botanically as a sorghum, being *Sorghum sudanense*, contains approximately one-quarter as much HCN as sorghum at corresponding periods of growth. Farmers should therefore be cautious in utilising this crop, especially if doubtful of the source of seed supply, as all sorghums hybridise readily. It is realised that many stockowners have fed off Sudan grass at all stages without ill-effects, but it is necessary to point out that fatalities have also been reported as a result of this practice.

Johnson grass (*Sorghum halepense*) is distinctly poisonous, as it contains a greater quantity of HCN than any of the cultivated sorghums. As Johnson grass seed closely resembles that of Sudan grass, buyers of Sudan seed should be particularly careful of the source of supply.

Sugar.

Growing conditions for the young crop were generally unfavourable during the latter half of December. Hot, dry conditions in the far North have seriously checked the cane, and although the absence of heavy rains will effectively check the emergence of beetles, the crop is urgently in need of moisture. Similar conditions obtain in the Mackay area, but the recent beneficial rains in the southern districts have maintained continuous crop growth in those parts, and there is every indication that heavy tonnages will again be recorded in 1935.

The south-eastern and Darling Downs farm and dairying lands are experiencing a bountiful season, prospects for all summer crops being excellent, while dairy production has reached a high level. Owing to this high production dairying is now the most remunerative occupation in many districts in spite of the lower price levels prevailing. At the time of writing the northern farming lands are still urgently in need of rain, so that cane, tobacco, and all seasonal crops are suffering. The central-western pastoral areas are also in the grip of drought and all stock routes are being closed.

Plate 87.—Auto-header Commencing a Round, Zeisemer Bros.' Farm, Bongeen, Darling Downs.

The sugar yield is estimated at 610,000 tons, as compared with 638,000 tons for the 1933 season. In many mill areas, however, large areas of cane were allowed to stand over.

Two of the mills in the Burdekin area are still crushing the 1934 crop, but it is expected that the decline in sugar content of the cane due to further growth will result in an early cessation.

Conditions for the 1935 crop were variable during the past month. In the southern cane areas generally favourable conditions were experienced, and the crop has made very satisfactory progress. There can be little doubt that most mills in these parts will again be faced with excessive cane supplies for the 1935 crushing.

Portions of the Mackay area have been favoured by thunderstorm rains, which have maintained reasonable growth in the crop; but in other parts soaking rains are urgently required to revive the wilting cane.

PLATE 88.—AUTO-HEADER AT WORK IN BADLY LODGED CROP, J. FLEGLER'S FARM, EVANSLEA, DARLING DOWNS.

The Burdekin district has experienced hot, dry conditions, and irrigation plants are working at full pressure.

In the far northern areas one of the worst dry spells on record has had a damaging effect on the young cane. The rainless conditions extended through December and the first half of January, but were broken by good rains during the past week. Doubtless the severe growth check will be reflected in the ultimate yields, and it is fairly safe to predict that no mills in those districts will this year produce cane in excess of their peak-year allotments.

Wheat.

Deliveries to the Board are practically finalised, and growers on the extensive plain lands are already working the clock round preparing their land in readiness for the autumn sowing. Heavy rains have held

PLATE 89.—AUTO-HEADER AT WORK, ZEISEMER BROS.' FARM, BONGEEN, DARLING DOWNS.

Plate 90.—A Harvesting Scene on J. Flegler's Farm, Evanslea, Darling Downs.

up the work in many districts, but much of this moisture will be conserved by judicious cultivation. The recent crop, although insufficient for the State's requirements, was of higher quality than in previous years. It is estimated that 1,500,000 bushels will need to be imported, so that Queensland wheat farmers still have some leeway to make up.

Cotton.

The seasonal conditions, while at times tending to make somewhat sappy growth of plant, have been favourable as a whole, for satisfactory development of the cotton crop. In sections of the Upper Burnett excessive rainfall in November promoted such rank growth of grass and weeds, as well as actually washing out the crops, that some abandonment of acreage resulted. Generally speaking, however, the growers have accomplished good control of the weed and grass problem, and the fields are in a satisfactory state of cultivation, although strenuous efforts have been required to bring this about.

Plate 91.—A "Battery" of Auto-headers Advancing en Echalon on J. Flegler's Farm, Evanslea, Darling Downs.

PLATE 92.—AUTO-HEADER DELIVERING THE BAGGED GRAIN ON J. FLEGLER'S FARM, EVANSLEA, DARLING DOWNS.

Although the crop was roughly a fortnight late at the start, the good growing conditions have forced plant growth, and the earlier-sown crops are about of normal development. Flowering is general in all districts, and given a continuance of such favourable conditions, the prospects are bright for very satisfactory yields being obtained generally. Seed sufficient to plant from 60 to 65,000 acres was applied for this season, and it is estimated that around 60,000 acres are now in condition to produce a yield. It appears likely that another record crop may be produced.

PLATE 93.—WHEAT DELIVERY AT THE GRAIN SHED, BONGEEN, DARLING DOWNS.

Peanuts.

The 1933-34 crop was the second largest handled by the Peanut Board. Prospects for the present crop are very encouraging, as 10,500 acres are sown, mainly to the Virginian and Spanish varieties, and sufficient moisture exists to carry the crop through to maturity. However, growers have a big task in cleaning up their areas following on the excessive rains experienced during January.

Tobacco.

Conditions are satisfactory in the Texas and adjoining districts, where the crops are well advanced. Planting out is in full swing in the Central districts, where normal growth and comparative freedom from disease is being experienced. The North is not so fortunate, as planting is largely held up for lack of rain, and those areas already planted are maturing too rapidly for best results.

General.

Maize grain has been in demand for drought relief, which should reduce the carry-over and help to stabilise prices. Heavy main crop sowings have been made under good conditions, with the exception of the Atherton area, where 25,000 acres sown during December urgently require rain.

The early potato crop has been satisfactory both for yield and the prices received. Growers will be interested to know that this Department has made small experimental sowings of Victorian and Tasmanian varieties, some of which have compared favourably with the varieties in general cultivation. However, it must be emphasised that while the trials are in progress no distribution of seed can be attempted.

Those contemplating the use of fertilizer are reminded that the bonus of 15s. per ton has been renewed until 30th June, 1935, the necessary application forms being available at all country post offices.

TO PRESERVE HARNESS.

1. Before oiling harness or other leather, add a little kerosene to the oil. This will prevent rats and other vermin attacking the leather.

2. Get a fresh shin-bone, break it open and extract the marrow. Melt the marrow down and add an equal quantity of castor oil. Rub the mixture warm into the leather, first washing the sweat and grease off with warm water and soft soap. Never use castor oil alone; it will perish any leather.

3. A harness dressing that will prevent rats from chewing the leather can be made by mixing a gallon of castor oil, a pint of salad oil, and ½ lb. beeswax.

4. To revive old, cracked harness, apply a mixture of 2 oz. beeswax, 1 oz. of lamp-black, and a pint of oil. To keep harness in good condition, wash it with potash water and when dry apply harness blacking. To keep leather pliable, rub tallow, lamp-black, or waste oil on.

5. To get a good home-made harness dressing, mix 2 lb. mutton fat with 3 lb. beeswax and heat over a slow fire. Add 4 lb. sugar, 2 lb. lamp-black, 2 lb. soft soap, ½ lb. indigo. For brown harness leave out the lamp-black and the indigo.

The Poultry Industry in Queensland.

By P. RUMBALL, Poultry Expert.

POULTRY-raising is now a very definite and important branch of agriculture. This is due largely, in the first instance, to the labours of the specialist breeder in the production of high-producing strains of birds; secondly, to the modern method of hatching and distribution of chickens; thirdly, to the more efficient method of feeding and general management; and, finally, to co-operative effort on the part of the producer.

Although the specialist poultry breeder has played a most important part in the building up of the organisations that exist, a very large percentage of our eggs are produced upon the general mixed farm, and it is considered by the writer that if further expansion of the poultry industry is to take place, such expansion would be sounder as a definite part of general farming rather than as a specialised calling.

Departmental Activities.

In the building up of the industry, the Government has been an important influence. On the staff of the Agricultural Department there have for many years been attached experts whose duty it has been to advise and instruct beginners in all phases of poultry culture. These officers have pursued an intensive educational campaign and have travelled from one end of Queensland to the other, advising and rendering assistance to all interested in the business.

As well as catering for the producer in this way, the Department for years conducted egg-laying competitions with the object of demonstrating to the breeder the variation in production that may occur among birds of the same breed, and to induce breeders to improve the production of their flocks by selection, and by only breeding from their highest producers.

The interest taken by poultry-raisers in the work has been evinced by poultry clubs and agricultural organisations building their own pens and conducting their own laying contests, and to-day we have no less than eleven egg-laying competitions conducted along the coastal area from Toowoomba to Cairns, clubs having taken up competition work, the Department vacated this field of activity and concentrated upon nutritional and disease research at the Animal Health Station, Yeerongpilly.

Several reports of the results of nutritional investigation conducted at the Station and a report on the results obtained with various methods of treating internal parasites have been published in the "Agricultural Journal." At the present time, further experiments are being conducted with respect to internal parasites, while no less than six experiments of a nutritional nature are under way.

The conducting of experiments, however, is not the only work carried out at the Animal Health Station on behalf of the poultry-raiser. The post-mortem examination of poultry has become in the last few years a very big item. This work, coupled with the correspondence entailed, together with disease investigation, is no small contribution to the welfare of the industry.

Poultry Clubs.

Poultry clubs are functioning in many centres throughout the State. With few exceptions club members meet regularly for the exchange of ideas, and informative addresses are given by the more skilled among its members or by some other person of authority. Many clubs, as previously mentioned, have taken an active part in the conduct of egg-laying competitions. This has brought before poultry-raisers living in close proximity to where these tests are conducted the advantages to be gained by the keeping of well-bred and well-fed birds better than any centrally conducted test could have done, and now it is the exception to the rule to see any but well-bred flocks on our farms.

Poultry clubs are also the means of disseminating the results of Departmental investigations conducted at the Animal Health Station, and from any other authoritative source.

Economic production has received the attention of clubs, the results of one—the National Utility Poultry Breeders' Association—being an outstanding achievement of co-operation.

PLATE 94.—MR. STANLEY LLOYD.
Chairman of Directors, Poultry Farmers' Co-operative Society.

Successful Co-operation.

The Poultry Farmers' Co-operative Society is relatively a young organisation. It was one time known as "Nupba"—a title formed from the initials of the National Utility Poultry Breeders' Association.

Many of the members were not dependent on poultry-raising for a living, but had become associated with poultrymen through a lively interest, as amateurs, in the industry. They were quick to appreciate the difficulties under which poultrymen were struggling, and realising what a valuable place poultry-farming might and should occupy in the State's agricultural operations, conceived the idea of promoting this co-operative organisation to purchase and distribute foodstuffs, these being the most expensive items in the business of poultry-raising. They

recognised that the principles of co-operation would ensure honest trading, pure and high quality goods, and a saving of money by reducing the distributing cost of poultry foods. Further, they ensured that any profits resulting from the undertaking would remain in the industry.

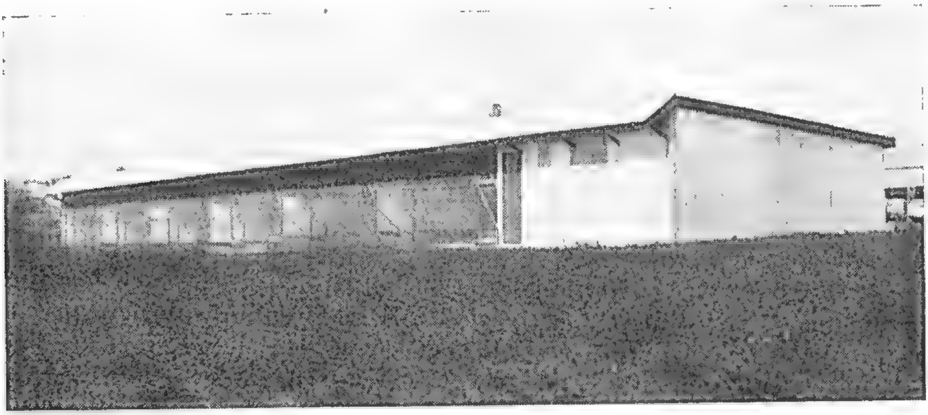


Plate 95.

Intensive poultry-house at the Animal Health Station, Yeerongpilly. At the right is the feed-room; the brooding-pens are to the left.

Education in Co-operation.

The society is something more than a trading concern. It has an intimate knowledge of the requirements of its customers and, in addition to providing a service in regard to delivery which was previously unknown, it disseminates knowledge on poultry culture and offers free advice on any subject bearing on the industry, both verbally and by means of printed pamphlets. It is difficult to assess the value of the service the society has rendered to the industry, and it has been instrumental in lightening the poultryman's burden considerably by securing reductions in freight charges and improving generally the status of the industry, irrespective of the great saving in prices which has resulted from the combined operations of its members.

Apart from the small annual dividend on the capital invested, the whole of the profits of the society are distributed each year among members as a bonus on purchases, or used in the business for the

Plate 96.

Intensive poultry-house at the Animal Health Station, Yeerongpilly. At the left are the brooding-pens; at the right is the feed-room. Note the ventilation space at the back.

creation of further benefits. In this way more than £35,000 has been returned to the society's customers during the past ten years.

Plate 97.
Intensive poultry-houses at the Animal Health Station, Yeerongpilly.

The Progress of the Society.

The society has celebrated its thirteenth birthday, having been established in July, 1921, when there were eighty-five members, who contributed a total share capital of £511. The present membership exceeds 1,600, and the share capital exceeds £6,000.

In July, 1921, 8 tons of bran and pollard were purchased by the society's members. The present output is more than 100 times greater, being over 10,000 tons, or over a million bushels annually. In addition,

over 200,000 bushels of wheat are used as grain, besides huge quantities of maize, barley, oats, and other cereals.

The first store secured for the society's business was in the basement of a bulk store in Little Roma street. Mr. Woodcock, the present manager, combined the duties of director, manager, secretary, storeman, and clerk. To-day there are no fewer than fifty-seven persons in regular employment.

PLATE 98.—INSPECTING THE PENS, POULTRY FIELD DAY, ANIMAL HEALTH STATION.

Trans-Marine Trade.

The society, in 1923, exported 35,000 dozen eggs to England, and in so doing made history, for it was the first occasion on which a co-operative or poultrymen's organisation had shipped Queensland eggs overseas.

The growth of the business is best shown by the following figures: —Turnover for eighteen months ending 31st December, 1922, £20,217; for year 1923, £12,276; 1924, £12,430; 1925, £22,166; 1926, £41,993; 1927, £57,760; 1928, £83,472; 1929, £109,075; 1930, £104,240; 1931, £91,002; 1932, £130,628; 1933, £144,703; and for 1934, approaching £200,000.

The society, in October, 1924, manufactured the first bag of "Red Comb" laying mash, and in so doing launched a new industry for the State. Prior to that date all manufactured balanced poultry foods were imported. This branch of the business has grown rapidly, and new plant is being installed, with a capacity of 1,400 bags daily.

So successful have been the results that the society is now turning out "Red Comb" dairy food, calf food, and pig food, and these give every indication of becoming as popular as the other "Red Comb" products.

Apart from the large sums paid to members as bonus on purchases, the society has saved the industry tens of thousands of pounds in the first cost of the articles sold. It has created a healthy competition to the advantage of its members and the industry generally.

Plate 99.—Queensland Eggs Packed for Export.

Huge purchases on a co-operative basis are a benefit to farmers dealing from the society, and low overhead and working expenses have permitted profits to be made, notwithstanding the small margin over cost which the management allows. These profits, instead of being used for private gain, are retained in the industry.

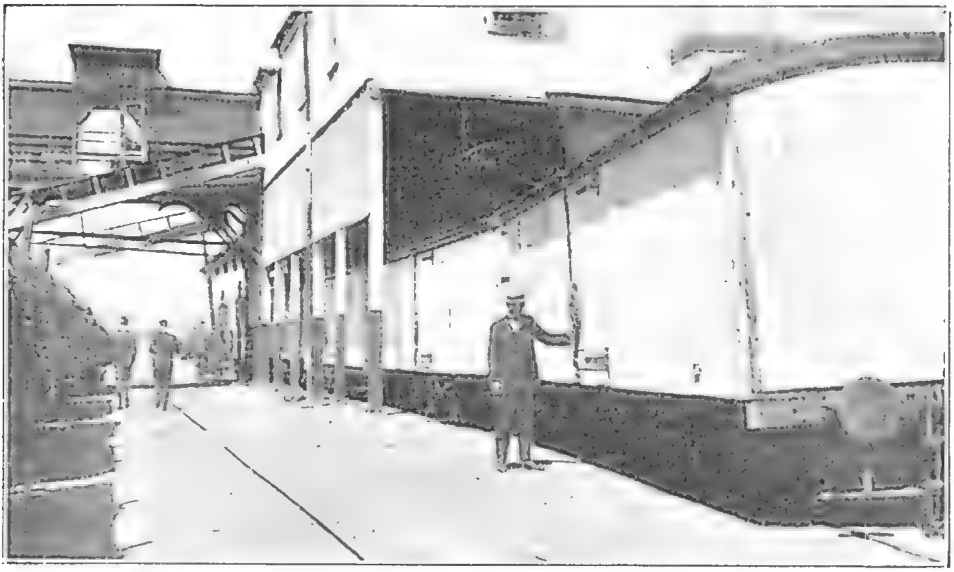


PLATE 100.—TRAIN OF SPECIALLY INSULATED TRUCKS LADEN WITH EGGS FOR OVERSEA SHIPMENT, HAMILTON COLD STORE WHARF, BRISBANE.

PLATE 101.—QUEENSLAND EGGS FOR BRITISH BREAKFASTS.
A Shipside Scene at the Hamilton Cold Store, Brisbane.

Special attention is directed to the Members' Accident Benefit Fund. When a member of the society is permanently disabled or dies as the result of an accident, power has been given to the Board of Directors to grant to the next-of-kin or such person as shall have been previously nominated by the member a sum, not exceeding £250, equal to the member's purchases for the year ending 31st December immediately prior to the accident. This benefit is provided without any premium or additional cost to the member.

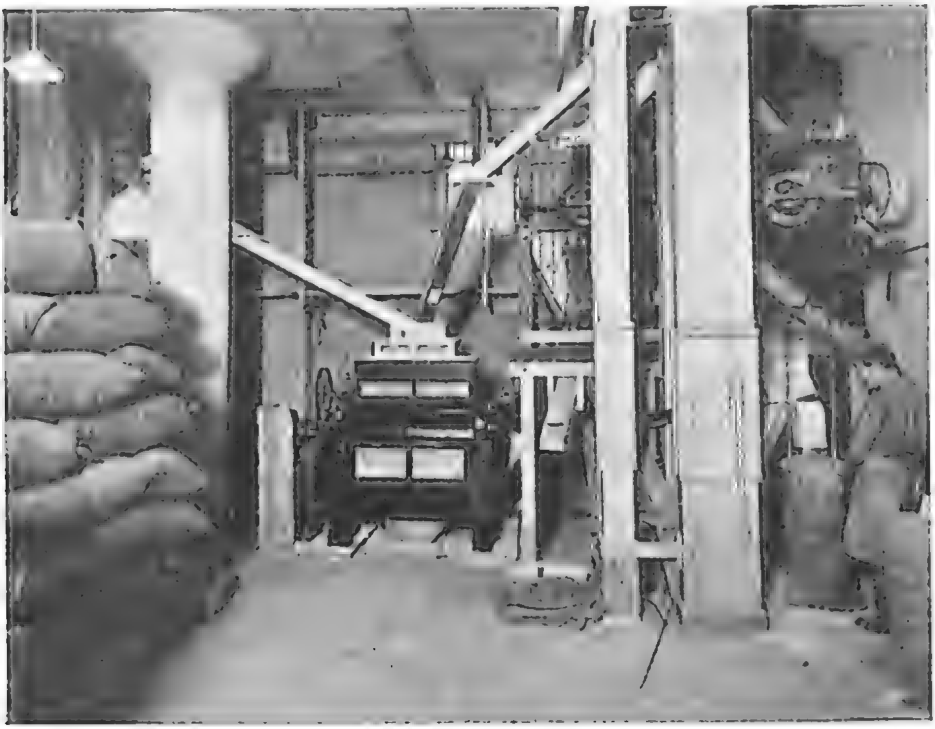


Plate 102.—A Section of the Cleaning and Grading Machinery, Poultry Farmers' Co-operative Society's Mills, Brisbane.

Organised Marketing.

Organised marketing has to the present been confined to the marketing of eggs, but there is every prospect that co-operative effort will be directed, in the near future, to the marketing of live and dressed poultry.

The Queensland Egg Board—a Board that has been functioning for approximately eleven years—controls in the main the marketing of eggs produced in Southern Queensland. On the Atherton Tableland a co-operative society with its headquarters at Tolga is operating on behalf of producers in that area.

That the operations of the Queensland Egg Pool are appreciated by the majority of growers is evidenced by the continuance of the Pool, which has now been submitted to several ballots for its continuance or otherwise. This Pool is controlled by a Board of five elected representatives of the producer, and the Director of Marketing.

Prior to the establishment of the Egg Board, eggs during spring months used to fall in value to a level that left little or nothing over

costs of production. To-day, despite considerable expansion, values during spring months are on a par with those ruling ten years ago. This condition is undoubtedly due to the Board's vigorous policy of exporting the surplus.

It may appear to many that as export has done so much to keep the industry in a reasonably sound condition, the Board had little to do apart from packing for this trade. The Board, which commenced operating during 1924, had met and surmounted many difficulties. The first was financial. The Government, however, helped it out in the early days by guaranteeing its bank overdraft to the extent of £10,000. The Board now is in the happy position of having a general reserve fund to the extent of £20,000, and are therefore more or less free from financial worry.

PLATE 103.—HIS EXCELLENCY THE GOVERNOR, SIR LESLIE ORME WILSON, INSPECTING THE MACHINERY AT "RED COMB" HOUSE, BRISBANE.

Included in the group are Messrs. Stanley Lloyd (Chairman of Directors), R. Woodcock (Manager), and C. Kidd (Secretary).

Although spring prices have been maintained by the Board that compare favourably with those ruling prior to the establishment of a Pool, the general average price paid to the grower during the year has fallen. This fall in values is due to the ever-increasing supplies received by the Board, with the result that for the greater part of the year more eggs are being received than the local market can absorb.

It may appear to some a simple matter for the Board to export the surplus production. This, however, is not the case. A considerable proportion of the eggs forwarded to the Board in the early days of the Pool were rendered unfit for export on account of the uncleanliness

of shell. To correct this was the Board's first problem. Many producers who had been supplying the local market for years when cleanliness of shell was not of such importance, and also many beginners in the business, were difficult to convince that something more in the way of cleanliness of shell was wanted for export than had been the case in past years. Again, large numbers of eggs came from relatively small flocks from mixed farms. With this class of producer the usual practice was to sell to the local storekeeper or wait until a sufficient quantity of eggs were on hand to justify consigning to market. The constant

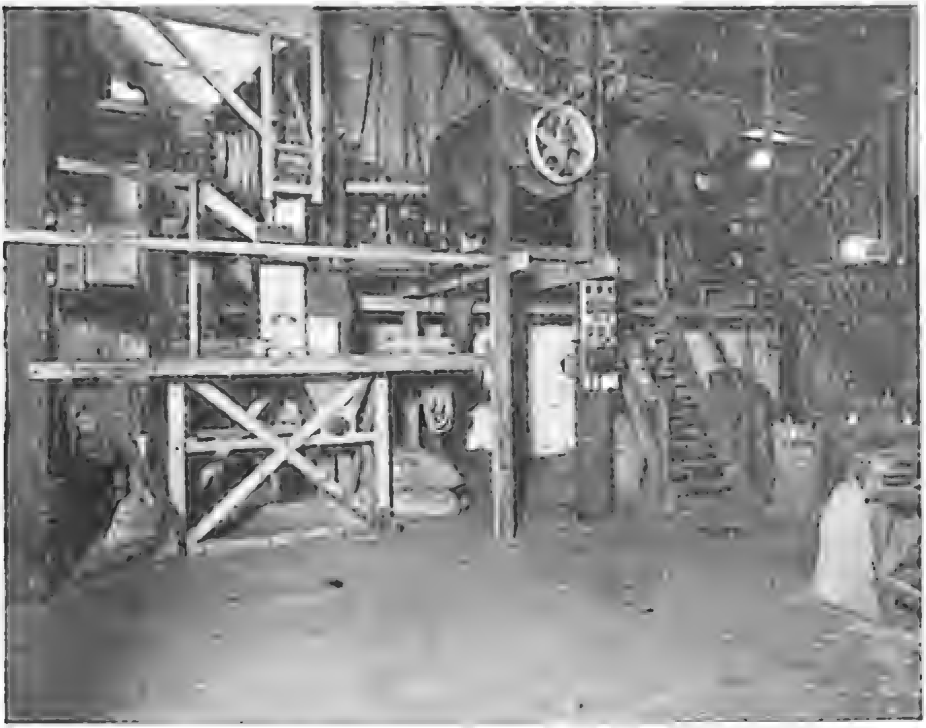


Plate 104.—Poultry Meal Mixing Plant and Disintegrator.

effort on the part of the Board has fortunately convinced poultry-raisers as a whole that cleanliness of shell is essential, and the action taken by the Board in encouraging the formation of egg circles and the appointment of forwarding agents ensures a considerable proportion of our production reaching the Brisbane market of export quality. The writer is pleased to be able to inform poultry-raisers that a prominent inspector of exports, while on a recent visit to Brisbane, stated that for cleanliness and quality the eggs received by the Board from farmers were second to none in the Commonwealth. Although a statement of this nature has been made, there are still some producers forwarding eggs to Brisbane to whose produce it would not apply.

Export Packs.

Various styles of packing have been tried from time to time, with the result that we have a standard of pack which is unequalled on the English market, and, what is more, the costs of packing are considerably less than for what was considered in the early days of the Pool the

most attractive and economic pack. The reduction in costs is in no small part due to the foresight and business acumen of those controlling the Pool.

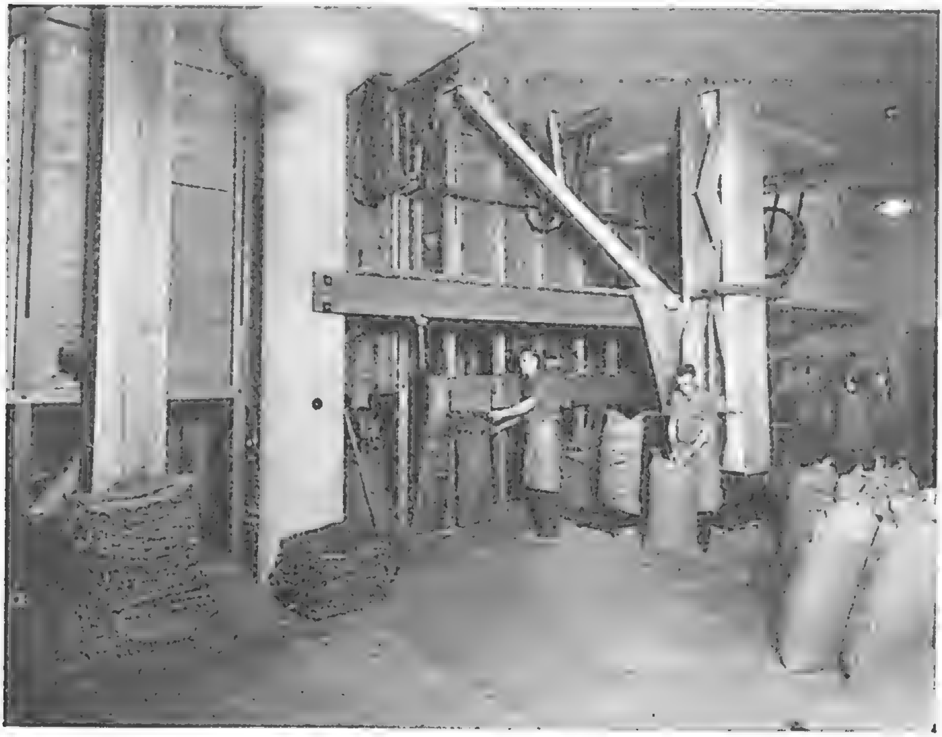


PLATE 105.—GRAIN MIXING PLANT.

Throughout the year, as well as during the export season, every egg received by the Board or its agents is candled and carefully graded as to quality and size. This action has been found essential in order to assure the sale of nothing but eggs true to label. That this practice is bearing fruit by way of increasing consumption is borne out by the statistics that accompany this article having reference to the Board's activities.

QUEENSLAND EGG BOARD STATISTICS.

Year.	Receivals.	Exported Overseas.	Total Sales, Export, Interstate, Pulp.	Local Sales.
	Dozens.	Dozens.	Dozens.	Dozens.
1924	1,445,000	Nil	234,555	1,210,445
1925	1,665,000	12,000	167,795	1,497,205
1926	2,777,000	189,000	436,975	2,340,025
1927	3,040,000	236,400	685,950	2,354,050
1928	3,967,000	823,860	1,580,018	2,386,982
1929	4,563,000	919,410	2,233,587	2,329,413
1930	3,935,000	831,150	1,934,361	2,000,639
1931	3,293,000	768,360	1,301,692	1,991,308
1932	3,728,000	1,301,430	1,667,109	2,060,891
1933	3,985,000	1,458,480	1,815,289	2,169,711

PLATE 106.—ROMA STREET PREMISES OF THE POULTRY FARMERS' CO-OPERATIVE SOCIETY.

Apart from the marketing of eggs, the Board has interested itself in many matters of importance to the poultry industry. It has taken an active part in the formation and work of the Egg Producers' Council, an organisation comprised of representatives of the principal egg-exporting organisations of the various States. It has played no small part in the preparation of egg grades governing eggs exported, and has interested itself in such matters as nutritional-feeding experiments, rail freights and their relation to both eggs and poultry fodder, and at all times has taken every possible action to further and protect the interests of poultry-raisers.

IMPORTATION OF SAANEN GOATS.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) announced recently that he had been in touch with the Queensland Government offices in London regarding the cost of securing Saanen goats from Switzerland. Details had now come to hand and these indicate that first-class male Saanen goats, about 1 year old, can be purchased in Switzerland for from £5 to £6, and first-class female goats, two to three years old, from £3 12s. to £5 each. The cost of bringing the goats from Switzerland to Brisbane is, of course, considerable, and it has been calculated that approximately the cost of conveying the six animals from Switzerland to Brisbane would be somewhat as follows:—

	£	s.	d.
Freight, Basel to Hamburg, or	4	15	0
Freight, Basel to Antwerp	4	16	0
Harbour dues	1	0	0
Freight, Hamburg or Antwerp to Brisbane £14 14s. each	88	4	0
Exchange	1	1	0
Extras in Switzerland	1	10	0
Care of animals, £2 2s. each	12	12	0
London Quarantine expenses	15	5	0
Colmslie Quarantine expenses	19	13	6
Cartage	1	0	0
	£145	0	6

The above works out at about £24 3s. 5d. per animal, and with the initial cost it can be taken that the cost of landing the goats in Brisbane would range from £28 to £30 each. It would probably be preferable to ship the goats from Switzerland, via France, to London, where they could undergo a preliminary quarantine under the direction of the English Department of Agriculture and Fisheries. They could then be shipped direct from England to Australia.

Agricultural conditions of Switzerland being those of small peasantry, the breeding and keeping of goats is, therefore, very important. Swiss goats are rated highly for their great yield of milk and for their fertility, and the flesh of the young wethers is highly esteemed in that country.

The Saanen goat is widely distributed over the western part of Switzerland and is the most common dairy goat of the country. It was first developed in the Saanental and Simmental of the canton of Berne, these valleys still being the centre of the breed.

As Saanen goats are rather adaptable and thrive under a wide range of conditions, exports have been made to nearly all parts of the world, and they are now distributed in Germany, Austria, Servia, Russia, France, and on the American Continent. On an average the Saanen is of somewhat more than medium size. It is pure white in colour, hornless, and of rather slender build. In Switzerland good class does are stated to average about two quarts of milk per day.

Notes on Fruit Marketing.

JAS. GREGORY, Instructor in Fruit Packing.

Apples.

EARLY eating apples are now being marketed. Standard packing using sulphite wraps is the most desirable method of packing. Growers are recommended to line the cases with corrugated cardboards, which give great protection to the fruit. Fruit packed in this way is sought eagerly by country order buyers, in preference to unprotected lines. It must always be remembered that the country order buyer is usually willing to pay top market price if the fruit is satisfactory.

With the export season at hand, growers should give full consideration to the actual state of their crop. Many orchards have a high percentage of fruit damaged with hail. To remove the fruit fit for export from lines of this description would entail a lot of trouble, possibly only 30 or 40 per cent. being fit to export. The remainder of the crop would not be fit to market anywhere. By mixing the hail-marked fruit with the good it would be possible to get quite a satisfactory line for local marketing. This is always a problem to face in a state of affairs of this description. Growers wrapping fruit should be certain that no fly is allowed to be included. Buyers prefer wrapped lines, but for quite a number of seasons they expressed the opinion that growers only wrapped to enable them to include fly-stung fruit. It would be a pity to spoil the goodwill created during the last few seasons.

Stone Fruits.

Apricots and cherries are now finished. Peaches and plums are now obtainable in lines of good quality. Careful attention to packing is necessary to eliminate as far as possible the chances of Brown Rot infection. Brown Rot it particularly prevalent this season. Fruit skins damaged even minutely will become infected much sooner than sound fruit, so growers will realise that the utmost care must be taken during harvesting and packing operations to avoid skin damage. Sizing and packing are necessary when marketing.

Citrus.

The season is now finished. Measures should be taken to see that all sheds, implements, cases, and other utensils are cleaned up in readiness for next season. This should be done to help eliminate chances of Blue Mould being carried over to next season. A 5 per cent. solution of formalin is a good spray to use, 1 part of formalin to 20 parts of water finely sprayed, or used as a dip for boxes, &c.

Tomatoes.

The writer of these notes was recently in Melbourne, and had the pleasure of inspecting some really first-rate lines of Queensland tomatoes from the Redland Bay district. This was in late December during quite a warm spell of weather, and amply proves what has always been contended, that Queensland tomatoes can be exported to Melbourne and Sydney provided care is taken in picking to maturity and packing. The

same state of affairs does not exist with fruit exposed for sale in Stanthorpe shops, it being hard at the time of writing—early January—to obtain really good ripe lines of fruit, most of the fruit giving the impression of being picked while immature. This fruit is being obtained mainly from metropolitan districts.

Papaws.

Inspections on the Melbourne market showed several unsatisfactory lines of fruit on the market. Growers must pack papaws with care, carefully wrapping each fruit in paper and "nesting" them in woodwool, placing a substantial layer of woodwool on the top and bottom of the case. I would recommend the placing of corrugated cardboard at the sides of the box in addition to the woodwool on the tops and bottoms. One line of fruit that I inspected, on repacking, showed approximately 60 per cent. waste, all of which could have been avoided with a little more care. It was a pleasure to see the famous Sunnybank brand of "Melloripe' papaws open up, the packing being all that could be desired.

Mangoes.

Bowen mangoes arrived in varying condition. Fruit wrapped and layer packed with woodwool always opened up in good order. One or two lines of fruit I examined, packed unwrapped and without the padding, showed a high percentage of waste. Half-bushel cases appear to be the best type of case in which to send this fruit to Melbourne. I would suggest that it would be even better to send mangoes in trays, such as are used by the pear exporters. The trays are put up in bundles of threes, the complete package looking like a dump case. Each tray measures 18 inches by 14¼ inches by 3 inches, or sometimes as a variation to suit the size of the fruit, 4 inches deep. I think a package of this description would suit the trade better, as mangoes at present are not a well-known fruit in Melbourne. Retailers wishing to introduce this fruit to customers can only afford to buy small containers, in most cases even a half-bushel case being too large a quantity. The trays would also have an excellent display value.

Pineapples.

Blady grass is still used by many growers. It is not a popular packing with retailers, the fruit as a rule opening in a damp musty condition. Woodwool is to be preferred in all respects, looking better and opening up in a sweeter condition. It was noticed that some growers still persist in pulling the fruit instead of cutting it. One or two lines of Bowen pines were harvested too green, and in consequence were hard to sell. By the time these pines colour sufficiently to sell, the fruit has developed a shrivelled, wilted appearance, which makes it unpopular with the public.

TO MEASURE LENGTH.

To measure the length of, say, a drain, tie a piece of white rag round a spoke of the wheel of a buggy, the vehicle being then advanced until the wheel has made a complete revolution. A mark having been made on the ground before starting, the circumference of the wheel is easily measured. Then by driving along the proposed route of the drain and counting the number of revolutions of the wheel the total distance is readily arrived at.

Tobacco Fertilizer Trials.

Subjoined is a report on tobacco fertilizer trials conducted in the Mareeba and Dimbulah districts during the 1933-34 season by Mr. W. J. Cartmill, B.Sc., Analyst, Department of Agriculture and Stock.

DURING the 1933-34 season, an effort was made to establish fertilizer trials on each of the major soil types of the tobacco areas of the Cairns hinterland. The aim was to establish about a dozen trials, distributed over the fairly diverse soil types of this wide area. However, owing to extremely adverse seasonal conditions, it was not possible to accomplish this aim. The ravages of blue mould and other fungus diseases were so severe that seedlings could not be obtained for some of the trials. Repeated efforts to establish others were rendered unavailing by the destruction of the young plants by torrential rain and by disease attacks. Eventually four trials were established satisfactorily, and the results of these are set out herein.

The trials were uniform in type and treatment, the object being to find out the effects of the three principal plant foods on the growth and quality of the plants and the extent to which these effects are governed by the various soil types. The blocks were each one-half acre in area, divided into twenty-five small plots by a 5 x 5 Latin square system of replication. The treatments used were as follows:—N P K, N P, N K, P K, and C where—

$$N = \left\{ \begin{array}{l} \text{160 lb. dried blood per acre (20 lb. N)} \\ \text{130 lb. nitrate of soda per acre (20 lb. N)} \end{array} \right\} = \text{40 lb. N}$$

P = 500 lb. superphosphate per acre = 100 lb. P_2O_5.
K = 105 lb. sulphate of potash per acre = 50 lb. K_2O.
C = no fertilizer.

On one trial a treatment of N_APK was used (Boundy Bros.) where—

N = 200 lb. per acre of sulphate of ammonia.
A = ,40 lb. nitrogen.
P and K are as previous.

These quantities of plant food were considered to be liberal for the requirements of the crop. The fertilizer mixtures used in the tests were prepared a few days prior to their applications in the field. The quantity for each plot was weighed and that for each row was measured so as to ensure a uniform application. The land was slightly ridged and the fertilizer distributed by hand in a broad strip along the middle of the ridges. The fertilizer was then covered by and mixed with the soil by further ridging and the land thus prepared for transplanting. The one departure from this procedure was in the case of J. Scott's trial at Koah. Here the grower transplanted the seedlings to the block prior to the application of the fertilizer, as he considered they were in imminent danger of destruction by mould while in the beds. The fertilizer was applied and hoed in a few days after transplanting.

The usual cultural practices as are ordinarily adopted by the grower were used during the growth of the crop.

The weather conditions at the commencement of the trials were abnormal. The rainfall was excessive and the temperatures generally were rather low. Later, normal conditions prevailed.

There was a difference in growth on the various plots according to the fertilizer treatment, which was particularly pronounced during the early stages. It was difficult to obtain a good stand of plants on plots without either phosphorus or nitrogen in the fertilizer treatment and on the plots without fertilizers. In the first place the plants would not strike readily, and then made such very slow growth after striking that many of them were destroyed early by insect pests and diseases, and so many replants were necessary.

Plants in the P K plots usually made no pronounced growth for several weeks after planting; the leaves manifested a pale yellowish-green colour, generally were small in size and stiff; the plants themselves were spindly. When about two months old the plants made fair development, and eventually grew to a fair size with leaves showing a yellowness when compared with other plots. The leaf from these plots cured brightest, but the yields generally were low.

Plants in the N K plots made very poor growth for a considerable time after striking. At this stage they were dark-green in colour and had a squat rosette formation, and remained without making any appreciable growth for several weeks. Insect pests, such as leaf miner and stem borer, played havoc with these plants, also bringing about an uneven stand of plants under these treatments. The plants eventually made fair growth, but were always late in maturing and could not be cured a bright colour.

Plants on the N P plots grew well and seemed in no way to be affected in growth by the absence of potash from the mixture. Their growth up to maturity was as good as those on the complete mixture (N P K) plots. However, as the plants reached maturity they manifested to a marked degree the symptoms of potash deficiency. The leaves became very curled and puckered, but otherwise were not much blemished. The leaf usually straightened out during the curing and cured satisfactorily. However, the quality of the cured leaf was not good. It was usually of poor texture and without any elasticity.

The plants on the N P K plots were apparently normal. Owing to their having been grown fairly late in the season the quality of the leaf was not of a high grade, the colour being about equally bright mahogany and mahogany.

Plants on the plots without fertilizer were slow in making growth at the start, but later made fair development excepting on the virgin grey sandy soil, where the growth was poor. Apart from their backwardness the plants showed no outstanding peculiarity.

None of the leaf was much blemished by spotting, so that comparisons in this respect between the plots could not be made with any assurance of a distinction. If anything, the N K plots had least spot and the N P most.

Numerous practical difficulties were experienced in the working of the trials, but a number of these can be attributed to the adverse seasonal conditions and the lateness in starting the trials, and which probably would be avoided in a season of more favourable conditions and with an early start. As previously stated, the scarcity of seedlings, especially of healthy seedlings, precluded the establishment of more trials. It is reasonable to expect that this trouble would not be of such consequence if an effort is made to establish the trials early in the season. One trouble, however, will probably always be experienced—that is, that some of the farmers concerned herewith, show a reluctance to plant out the plots until they are satisfied of obtaining sufficient seedlings for their own intended acreage for the season, or even until they have planted up same. The seedlings put into the plots in these circumstances are often the poorest of the bed and are difficult to establish. This trouble would of course be mitigated by a favourable season. Some neglect is shown with regard to cultural attentions to the plots, especially when the total acreage planted is beyond the farmer's management. In such instances the plots suffer most. During the past season most of the work was done by the Departmental officers; it took up a large proportion of their time and interfered with their professional duties. The work in connection with these trials is much enlarged by the lack of communication throughout the area. At planting and harvesting time, especially at the latter, frequent visits had to be made to the plots to find out on what day the farmer expected to be carrying out these particular operations, for usually such cannot be foretold beyond a day or two. This required much travelling about.

The harvesting and stringing operations were usually done by the Departmental officers, and as the leaf from the various plots had to be labelled and kept apart, the work involved was large. The number of harvests from each trial varied from six to ten.

The question of growing the same variety of tobacco on all the trials is worth considering. During the past season the varieties differed according to what was grown by the various farmers concerned. It is doubtful whether the practice of growing different varieties on different plots would in any way effect the conclusions arrived at, but, nevertheless, it is thought that uniformity in this respect would be desirable if it could be attained. This would require that the seedlings for all the plots be grown in a common bed or that the farmers be distributed with seed of the chosen variety and requested to set aside a seed-bed for the plot. However, against this arrangement must be set the possibility of losing the seedlings on account of disease and being left with none to draw on, so the question arises as to whether it would not be preferable to take advantage of the first crop of seedlings that happens to be available, irrespective of the variety, provided, of course, that the one variety is used in any one particular trial.

Reviewing the results, they show in general that in all cases the greatest response is given to phosphoric acid, but that it differs in degree according to the soil type. The greatest effect is noticed on the lighter and more porous soils, where there is little or no growth when phosphoric acid is not supplied in the fertilizer mixture. On heavier soils the response is not so marked.

There is also a good response to nitrogen, most marked in the porous sandy soils and less so in virgin and the heavier types. There is no

significant difference in yield and no apparent difference in quality shown between the treatments of sulphate of ammonia and nitrate of soda—blood. However, as the quality of either was not of a high grade owing to the crop having been grown late in the season, the comparison in this respect cannot be regarded as reliable.

The effect of potash is more marked on quality than on yield. In only one instance did potash give a significant increase in yield; but an absence of potash was noticed in all cases to affect the quality of the cured leaf adversely. In some soils it may be found that excessive supplies of potash decreases the yield. This matter needs further investigation.

TOBACCO EXPERIMENTAL PLOTS.

STIRRUP BROS., MAREEBA.

Variety.—Cash.

Planted.—Early in February.

Harvested.—June-July.

Growth.—It was difficult to strike plants on the N K and P K plots and on the plots with no fertilizer. However, they all subsequently made fairly good growth. Though there was a difference in growth and in appearance of the plants under the different treatments during the early stages, there was not much during the later stages.

Soil.—Red sandy.

Subsoil.—Red sandy (sl. clayey).

YIELDS :—lb. per acre of cured leaf.

NP 332	C 185	NK 463	NPK 644	PK 616
NPK 478	NK 332	C 457	PK 538	NP 588
PK 288	NPK 519	NP 782	NK 641	C 575
NK 225	NP 400	PK 541	C 560	NPK 669
C 275	PK 510	NPK 819	NP 625	NK 525

ANALYSIS OF VARIANCE.

Due to	Degrees of Freedom.	Sum of Squares.	Mean Square.	½ loge (Mean Square).
Rows	4	49,220·2	12,305·1	..
Columns	4	383,328·6	95,832·2	..
Treatments	4	149,001·0	37,250·3	1·8089
Errors	12	59,440·3	4,953·4	·8000
Total	24	640,990·1	..	..

$$\text{Standard error (5 plots)} = \sqrt{4{,}953 \cdot 4 \times 5}$$
$$= 157{\cdot}3$$
$$= 6{\cdot}2\%$$

SUMMARY OF YIELDS.

	NPK	NP	PK	NK	C
Yield (cured leaf), lb. per acre	625·8	545·4	498·6	437·2	410·4
Cured leaf, percentage mean yield	124·3	108·3	99·0	86·8	81·5

Discussion.

Significant response to phosphoric acid and nitrogen. No significant response to potash.

J. SCOTT, KOAH.

Planted.—Second week in March. Fertilizer applied a few days after planting and hoed in.

Harvested.—End of June. Plants uprooted and green weight taken.

Growth.—N K plots and plots with no fertilizer made practically no growth; P K plots moderate growth; N P and N P K plots good growth. The leaf on this block was blemished by mould spots to such an extent that the owner considered it would not repay harvesting the small quantity of leaf, as he had no more tobacco under cultivation. Consequently the plants were uprooted and the green weight taken.

Soil.—Light-grey sandy.

Subsoil.—Light-yellow sandy.

J. SCOTT, KOAH

YIELDS :—(Green leaf, lb. per $\frac{1}{50}$ acre plot).

NP 83	C 10	NK 11	NPK 94	PK 51
NPK 76	NK 14	C 17	PK 55	NP 66
PK 64	NPK 85	NP 125	NK 16	C 16
NK 9	NP 91	PK 77	C 14	NPK 81
C 8	PK 58	NPK 88	NP 73	NK 6

ANALYSIS OF VARIANCE.

Due to	Degrees of Freedom.	Sum of Squares.	Mean Square.	$\frac{1}{2}$ loge (Mean Square).
Rows	4	821·0	205·26	..
Columns	4	1,080·6	270·16	..
Treatments	4	28,043·4	7,010·86	3·2764
Errors	12	929·1	77·42	1·0233
Total	24	30,874·1	..	..

Standard error (5 plots) $= \sqrt{77{\cdot}42 \times 5.}$

$= 19{\cdot}7$

$= 7{\cdot}7\%$

SUMMARY OF YIELDS.

—	NPK	NP	PK	NK	C
Yield (green leaf), lb. per 1/50 acre	84·8	87·6	61·0	11·2	13·0
Green leaf, percentage mean yield	164·7	170·1	118·4	21·7	25·2

Discussion.

The increase due to phosphoric acid is very significant. Nitrogen has caused a significant increase, but potash has made no significant difference. This is a virgin soil, apparently very deficient in phosphoric acid.

BOUNDY BROTHERS, DIMBULAH.

Variety.—Cash.

Planted.—Second week in February.

Harvested.—June-July.

Growth.—Plants on N K plots were difficult to strike and made poorest growth during early stages. They were of a deep-green colour and assumed a squat-rosette form. P K plots were also very slow in early stages. Yellowish-green in colour, spindly in shapes with frenching of the leaves apparent.

N P K and N P plants made good growth of healthy appearance up to maturity, when leaves of plants on N P plots became curled and puckered. On N_A P K plots the plants made good growth. The colour of the leaves in the early stages of growth was a light-green, quite marked in comparison with N P K plants. Later (when six or seven weeks old) the plants quickly became of a deep-green colour. This in turn lightened off as the plants neared maturity. There was no marked difference in any respect between the cured leaf from the N P K and N_A P K plots. The plants in this trial were attacked by the stem borer during their early growth, and most of them were cut back to rid them of this pest. This operation did not apparently affect their subsequent growth.

Soil.—Light-pink gravelly sand.

Subsoil.—Light, red, sandy.

YIELDS:—Cured leaf, lb. per acre.

NP 450	N_APK 907	NK 41	NPK 778	PK 238
NPK 603	NK 275	N_APK 540	PK 316	NP 441
PK 207	NPK 738	NP 653	NK 250	N_APK 719
NK 132	NP 666	PK 253	N_APK 785	NPK 722
N_APK 500	PK 250	NPK 450	NP 478	NK 244

ANALYSIS OF VARIANCE.

Due to	Degrees of Freedom.	Sum of Squares.	Mean Square.	½ loge (Mean Square).
Rows	4	61,131·76	15,282·94	..
Columns	4	136,034·96	34,008·74	..
Treatments	4	1,071,237·36	268,559·34	2·7966
Errors	12	85,546·08	7,128·84	·9821
Total	24	1,356,950·16	..	..

Standard error (5 plots) $=\sqrt{7128\cdot84 \times 5}$.
$= 189$
$= 8\cdot1\%$

SUMMARY OF YIELDS.

	N_APK	NPK	NP	PK	NK
Yield (cured leaf), lb. per acre	690·2	658·2	537·6	252·8	188·4
Cured leaf, percentage mean yield	148·3	141·4	115·5	54·3	40·5

Discussion.

There has been a very significant response to both phosphoric acid and nitrogen. There has also been a significant response to potash. The difference between the sulphate of ammonia and the nitrate of soda-blood treatments is insignificant.

SHAW AND O'BRIEN, DIMBULAH.

Variety.—Hickory Pryor.

Planted.—Second week in February.

Harvested.—June and July.

Growth.—Poor growth on the N K and P K plots and on plots with no fertilizer during the early stages. Subsequently, all plots made fairly good growth. The fertility of the soil in this case seems to be above the average, which is probably the effect of residual fertilizer from previous applications.

Soil.—Pink, sandy.

Subsoil.—Reddish, sandy.

SHAW AND O'BRIEN, DIMBULAH.

Yields :—Cured leaf, lb. per acre.

NP 760	C 685	NK 640	NPK 665	PK 595
NPK 785	NK 715	C 700	PK 690	NP 795
PK 605	NPK 810	NP 805	NK 615	C 470
NK 545	NP 870	PK 625	C 535	NPK 695
C 630	PK 705	NPK 740	NP 725	NK 580

Analysis of Variance.

Dueto	Degrees of Freedom.	Sum of Squares.	Mean Square.	$\frac{1}{2}$ loge (Mean Square).
Rows	4	22,106	5,526·5	..
Columns	4	53,006	13,251·5	..
Treatments	4	132,966	33,241·5	1·7518
Errors	12	17,188	1,432·3	·1794
Total	24	225,266	..	..

$$\text{Standard error (5 plots)} = \sqrt{1{,}432{\cdot}33 \times 5} = 84{\cdot}6 = 2{\cdot}5\%$$

Summary of Yields.

—	NPK	NP	PK	NK	C
Yield (cured leaf), lb. per acre	739	791	644	619	604
Cured leaf, percentage mean yield	108·8	116·4	94·8	91·1	88·9

Discussion.

Significant response to phosphoric acid and nitrogen. The decreased yield due to potash is barely significant.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, The Guernsey Cattle Society, and The Ayrshire Cattle Society, production charts for which were complied for the month of December, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Elsie of Blacklands (365 days)	H. D. Giles, Biggenden	13,567·9	620·581	Jean's Monarch of Blacklands
Lorna 5th of Arley	E. W. Lawley, Maleny	9,184·15	388·12	Cinderella's Recruit of Greyleigh
Glenroy Lilly	W. F. Kajewski, Glencoe	8,560·37	379·032	Brilliant 2nd of Oakvale
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Springleigh Primrose 2nd (365 days)	Moller Brothers, Boonah	12,307·7	488·916	Red Knight of the Cedars
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Meadowvale Iris 5th	W. F. Kajewski, Glencoe	8,507·	361·602	Youll Do of Meadowvale
Westbrook Lark 5th	W. F. Kajewski, Glencoe	7,263·67	291·359	Sheik of Upton
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Glenroy Ruby	W. F. Kajewski, Glencoe	7,644·98	316·902	Empress Kitchener of Burradale
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Glenroy Emerald (365 days)	W. F. Kajewski, Glencoe	11,439·26	438·688	Glenroy Kitchener
Trevlac Rosette	W. J. Freeman, Rosewood	6,507·5	296·329	Butter Boy of Rhodes View

Junior, 2 Years (Under 2½ Years), Standard 230 Lb.				
Wandegong Dorothy	G. D. Lindenmayer, Binjour	9,312·5	338·662	Emperor of Spurfield
Meadowvale Favourite 19th	W. F. Kajewski, Glencoe	8,087·29	331·488	Youll Do of Meadowvale
Rhodesview Nancy 9th	W. Gierke & Sons, Helidon	6,739·22	298·842	Blackland's Prospector
Cedargrove Champion 6th (265 days)	W. J. Freeman, Rosewood	7,170·	296·825	Duke of Cedar Grove
Euroa Rexona	H. T. Lindenmayer, Mundubbera	8,084·	283,305	Swagman of Clonagan
JERSEY.				
Senior, 4 Years (Over 4½ Years), Standard 330 Lb.				
Billabong Daisy (365 days)	J. Mollenhauer, Moffatdale	10,432·1	543·2	Premier of Calton
Senior, 2 Years (Over 2½ Years), Standard 250 Lb.				
Hampstead Sapphire	Cecil Roberts, Harristown	5,916·59	326·214	Kelvinside Favourite's Raleigh
Junior, 2 Years (Under 2½ Years), Standard 230 Lb.				
Bellgarth Girlie	A. R. Slaughter, Clifton	5,906·85	333·56	Bellefaire Blonde's Noble Masterpiece
Lyndhurst Mary	J. B. Keys, Gowrie Little Plains	5,689·41	305·871	Lyndhurst Glider
GUERNSEY.				
Junior, 3 Years (Under 3½ Years), Standard 270 Lb.				
Linwood Sunbeam	A. S. Cooke, Maleny	6,557·25	335·951	Moongi Bright Boy
AYRSHIRE.				
Junior, 2 Years (Under 2½ Years), Standard 230 Lb.				
Fairview Myola Juliette	R. M. Anderson, Southbrook	5,843·8	268·382	Longland's Bonnie Willie 2nd

Land for Grazing Homestead Selection

BLADENSBURG RESUMPTION.

WINTON DISTRICT.

40,430 acres .. .. Sheep land.

Portion 2, parish of Williams, situated on Williams and Meteor Creeks, about 32 miles south-west of Winton, will be opened for Grazing Homestead Selection at the Land Office, Winton, on Tuesday, 26th March, 1934.

Term of lease, 28 years; rent, 1¼d. per acre for first 7 years. Provisional valuation of improvements, £2,150. The improvements consist of fencing, a hut, sub-artesian bores, and equipment.

Part of the area is rough, but the greater part consists of open downs grassed with Flinders, Mitchell, button, blue, and other grasses.

The area is sufficiently watered, and is suitable for woolgrowing, fattening, and breeding.

Stocking conditions will apply.

Free lithographs and full particulars obtainable from the Land Agent, Winton, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence Bureaux, Sydney and Melbourne.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Answers to Correspondents.

BOTANY.

Selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Russell River Grass.

C.P. (Gympie)—

Paspalum paniculatum, Russell River Grass, a very common grass in North Queensland. It was much boomed as a fodder some years ago under the name of *Paspalum galmarra*, but has since gone out of favour. Like some other grasses, however, such as Molasses Grass, stock seem to take to it readily when other feed is not available. In North Queensland, where the grass is very common, especially on parts of the Atherton Tableland, horses are said to be remarkably fond of the seed heads, and when feeding on them have a very sleek appearance with glossy coats.

The Bottle Tree.

A.H.B. (Brisbane)—

The common Bottle Tree of the Burnett district is *Sterculia rupestris*. The genus is a fairly large one and contains some well-known Australian trees. Two other species of Sterculia are known as Bottle Trees in Queensland; one, which grows in the scrubs in the coastal belt, is known as the Scrub Bottle Tree; the other, with a large lobed leaf and common in parts of Central Queensland, on the coast and on some of the islands of the Whitsunday Group, is known as the Broad-leaved Bottle Tree. Neither of these produces anything like so shapely a "bottle" stem as the one from the Burnett and parts of the northern Darling Downs.

The nearest ally of the Bottle Trees is the Currajong. The seeds of the Currajong have been used as a substitute for coffee, though when roasted and ground they have far more the flavour of cocoa. This is not surprising as botanically our Bottle Trees and Currajongs are very closely related to the Cocoa Tree which produces the cocoa of commerce. Possibly Bottle Tree seeds could be used in the same way as those of the Currajong, although we have not heard of their being so employed anywhere in the country where we have been.

The Bottle Tree referred to possesses what is known to botanists as dimorphic foliage, that is, the leaves are of two distinct types, those on the young trees being very different from those on the adult or large trees. In the seedling trees they are very narrow and radiate out like a number of thin fingers. In the adult trees the leaves become shorter and broader, and quite entire or very slightly lobed. The flowers are insignificant. The male and female flowers are distinct, but borne on the same tree, some trees bearing a preponderance of male, others a preponderance of female flowers. This accounts for the fact that some trees bear so much heavier crops of seed than others.

A very beautiful member of the Sterculia family in flower in the coastal scrubs or jungles from the middle of November till shortly after Christmas is the Flame Tree (*Sterculia acerifolia*), a tree with a wide range in its wild state from the Illawarra district of New South Wales to the Cairns district in North Queensland.

Birdwood Grass.

"Inquirer" (Toowoomba)—

We have made some inquiries about Birdwood grass and have received a letter from Mr. C. A. Gardner, Government Botanist, Perth, Western Australia, who informs us that it is *Cenchrus biflorus* and was sent by General Birdwood to one of his sons-in-law in Western Australia. It has proved an exceedingly hardy grass of particular value for the dry, summer-rainfall areas of that State.

This Department has experimented with two species of Cenchrus, namely *C. pennisetiformis* and *C. ciliaris*. These certainly have promise for some of the northern parts of the State, and we strongly suspect that the one we grow under the name of *Cenchrus pennisetiformis* is the same as Birdwood grass. It is known here and in the Northern Territory as Buffel grass.

Flame Tree. "Peanut" Tree.

A.I.B. (Eumundi)—

1. The Flame Tree (*Sterculia acerifolia*), a native of coastal Queensland and Northern New South Wales. In some of the scrubs the trees reach a very large size. It is quite common now as a garden and ornamental tree. When in flower the tree is a very brilliant sight, but the individuals vary considerably in the amount of bloom they produce.
2. *Sterculia quadrifida.* The only local name we have heard applied to this tree is Peanut Tree. The seeds when freed of the black coatings are quite palatable nuts.

The Candle Nut.

INQUIRER (Brisbane)—

The specimens have been determined as the Candle Nut (*Aleurites moluccana*), a native of Northern Queensland and widely spread through the Pacific. It is much planted as an ornamental and nut tree in many parts of the State. The nuts are edible, but great care must be exercised in eating them as occasionally they cause severe vomiting and purging. Possibly in these cases the nuts have been in a rancid condition when eaten, but on this point we are not too sure. From personal experience one may suffer very severely from eating candle nuts at the "wrong time." The nut contains a useful drying oil, but this is nothing like so valuable as that of the allied *Aleurites Fordii* and *Aleurites montana.* Attempts to find a market here for these nuts on account of the oil they contain have never met with any success.

Eucalypts and Acacias.

J.D.P. (Calvert)—

The number of species of Eucalypts and Acacias varies as given by different authors according to their view of the limits of the species, but the following are approximately correct:—

Eucalypts in Australia	550
Eucalypts in Queensland	85
Wattles or Acacias in Australia	400
Wattles or Acacias in Queensland	130

Grasses Described.

L.W.B. (Esk)—

Brachiaria decumbens.—A perennial grass, so far as known, confined in its wild state to Uganda, tropical Africa. The genus Brachiaria is a fairly large one and practically all the species are excellent fodder plants. We have several native species in Queensland and practically all are relished by stock.

Brachiaria brizantha.—A very robust perennial species of Brachiaria, a native of tropical Africa where it is widely spread throughout Upper and Lower Guinea, through the Nile region, and through many parts of the Mozambique district. It seems to have quite good possibilities as a fodder here.

Lespedeza stipulacea.—A leguminous plant allied to the Korean Clover and Japanese Clover. We think it is the poorest of all the Lespedezas introduced, and do not consider it as having much value at all. It grows during the summer months, dying down in autumn with the approach of winter.

Chloris pycnothrix.—Rather a small-growing grass. Judging just from appearances it does not seem to possess any outstanding value, though experience alone will show what its value actually is.

Digitaria Pentzii.—A species of Woolly Finger grass. It and an allied species (*Digitaria eriantha*) seem to have quite good possibilities in Queensland as fodders, particularly for growing on some sandy lands where other grasses will not thrive. We think there is country of this type in the Esk district that graziers have found rather hard to grass, and in such places it might be well worth trying.

Pennisetum ciliare.—This is a species of Buffel grass. It is widely spread in Africa, both in South Africa and Tropical Africa, Madagascar, Canary Islands, Madeira, Sicily, and extending eastwards to India. It seems to have good possibilities in some districts.

Trees Suitable for the South Burnett.

INQUIRER (Murgon)—

Our choice for an avenue of trees for Murgon would be the so-called Portugese Elm (*Celtis sinesis*), a tree of which we have seen some beautiful examples in the Burnett district. The crown is very spreading and the tree does not grow too high. The Portugese Elm is a deciduous tree, but it loses its leaves for only a very short time in winter and makes a very dense shade during the hotter months. If you would prefer an evergreen, Tulip Trees (*Arpullia pendula*) could either be planted by themselves or alternating with *Celtis sinensis*. Other trees that would grow very well in your district and make shapely avenue or street trees are the Crow's Ash (*Flindersia australis*) and Yellowwood (*Flindersia Oxleyana*). The following are some other trees you might care to plant either as individual specimens or as avenue trees about the town:—

The Camphor Laurel (*Cinnamomum camphora*). Makes a very shapely tree but the root system is rather extensive, and when planted near private gardens residents are apt to complain that the roots rob the soil of all nutriment. A good deal of complaint has been made in this direction in Brisbane.

Jacaranda. The common Jacaranda makes a good avenue tree. It requires a little attention in its younger stages. Grafton, New South Wales, which has been called the City of Trees, is noteworthy on account of some exceptionally fine avenues of Jacarandas.

Figs. Some of the Figs would do well in your district. Probably the best is *Ficus platypoda*, the small-leaved Moreton Bay Fig, or *Ficus rubiginosa*, the Port Jackson Fig. The latter makes an exceptionally shapely tree, not too large, but like all Figs the roots are very extensive and apt to do damage to gutterings, water mains, footpaths, &c.

Pines. Some of the exotic pines make densely foliaged, evergreen trees. For planting at Murgan I should think either *Pinus longifolia* or *Pinus caribaea* would be the best. Young plants perhaps could be obtained from the nearest nursery of the Forestry Department.

A Poisonous Berry (*Solanum Seaforthianum*).

J.H.S. (Atherton)—

The specimen represents *Solanum Seaforthianum*, a native of the West Indies and Tropical America that of late years has run out and become quite naturalised in many of the rain-forest areas of Queensland. Specimens have been received at different times with the report that children have been made violently ill through eating the berries, though we do not know that any actual deaths have been reported. The berries are often accused of poisoning poultry, though, strange to say, fruit-eating birds must eat the fruits with impunity as it is evidently by them that the plant is spread. The reason why fruit-eating birds may eat the berries with impunity is said to be that the solanin is contained mostly in the seeds and these are avoided by the birds.

Wild Sorghum.

H.H. (Iveragh, N.C. Line)—

The specimen forwarded with your letter of 11th instant represents *Sorghum verticilliflorum*, commonly called Wild Sorghum, now very common as a naturalised grass along railway cuttings, cultivation headlands, or, in fact, anywhere where the ground has been disturbed. There are several closely allied Sorghums which are very difficult to tell from small pieces of the seed head. These are Sudan grass, Johnson grass, and the Wild Sorghum, but we think there is no doubt that the one you send is as determined. It is a tall-growing grass and is distinguished by its perennial root system. When the plant is dug up or pulled up buds of young shoots can be seen at the base. Johnson grass has long, white, underground runners and Sudan grass has an annual rootstock. Wild Sorghum is not a particularly good fodder plant, as from tests carried out by the Agricultural Chemist it is shown to be exceedingly strong, at practically all stages of its growth, in a prussic acid yielding glucoside. In this respect it is one of the worst of the Sorghums so far tested.

General Notes.

Staff Changes and Appointments.

Mr. Halley Atherton, of Tedlands, Koumala, has been appointed an Honorary Ranger under and for the purposes of the Animals and Birds Acts.

Mr. W. E. Burnett, Inspector of Stock, Cadarga, via Chinchilla, has been appointed also an Inspector of Dairies.

The following persons have been appointed Honorary Rangers under the Animals and Birds Acts for the protection of native fauna in the Clermont district:—Mr. Wm. R. Tindale, Manager, Craven Station, Clermont; Mr. C. D. Tindale, Manager, Pacha Station, Clermont; Mr. Thos. Salmond, Manager, Albro Station, Clermont; and Mr. G. A. Fairbairn, Manager, Logan Downs Station, Clermont.

In order to ensure the better protection of native fauna, particularly the Torres Strait Pigeon, in the Mossman district of North Queensland, Mr. Wm. R. Porter, of Mossman, has also been appointed an Honorary Animals and Birds Ranger.

Messrs. T. G. Graham (Instructor in Agriculture, Mareeba), E. F. W. Ball (Assistant Experimentalist, Brisbane), and W. J. Cartmill (Analyst, Mareeba), officers of the Agricultural Branch of this Department, have been appointed also Inspectors under the Diseases in Plants Acts.

Senior Sergeant J. A. D. Bookless, Toowoomba, and Constable M. H. Baker, Ingham, have been appointed also Inspectors under the Slaughtering Act.

Mr. J. D. W. Ogilvie, Grading Inspector, Dairy Branch, has been appointed Dairy Instructor, Department of Agriculture and Stock.

Mr. W. B. Horneman, Dairy Inspector, Rosewood, has been appointed also an Inspector under the Diseases in Stock and Slaughtering Acts.

Mr. S. A. Clayton, Inspector of Stock and Dairies, Caboolture, has been appointed also an Inspector under the Slaughtering Act.

Messrs. J. C. J. Maunder, C. R. Mulhearn, A. L. Clay, and R. Nott, Government Veterinary Surgeons, Department of Agriculture and Stock, have been appointed also Inspectors under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts.

Messrs. F. N. King and J. B. King, of Tulliwallah Station, Clermont, and Mr. A. F. Brand, Norwell, have been appointed Honorary Rangers under the Animals and Birds Acts.

On account of transfers to other centres the following Police Magistrates and Clerks of Petty Sessions have been relieved of their positions of chairmen of the local sugar cane prices Boards undermentioned:—

> Messrs. A. H. Aitkin—Goondi, Mourilyan, South Johnstone, and Tully Local Boards. H. B. Carney—Macknade and Victoria. M. Gallagher—Farleigh, Marian, Plane Creek, and Pleystowe Local Boards. C. D. O'Brien—Bingera, Fairymead, Gin Gin, Millaquin, and Qunaba. J. C. Baker—Isis. F. W. Schafer—Mossman.

The following have been appointed to the vacancies thus created:—

> Messrs. W. Rillie, Police Magistrate, Innsfail—Chairman, Goondi, Mourilyan, South Johnstone, and Tully Local Boards. C. B. Buxton, Police Magistrate, Ingham—Chairman, Macknade and Victoria Local Boards. T. H. Kennedy, Police Magistrate, Mackay—Chairman, Farleigh, Marian, Plane Creek, and Pleystowe Local Boards. A. H. Aitkin, Police Magistrate, Bundaberg—Chairman, Bingera, Fairymead, Gin Gin, Millaquin, and Qunaba Local Boards. J. G. Fitzsimon, Clerk of Petty Sessions, Childers—Chairman, Isis Local Board. T. W. Foran, Clerk of Petty Sessions, Mossman—Chairman, Mossman Local Board.

Similarly, Messrs. Aitkin, Carney, Gallagher, O'Brien, Baker, and Schafer, who held the appointment of Agent of the Central Sugar Cane Prices Board for the purpose of making inquiries in regard to sales and leases of assigned lands, have been relieved of such appointment, and Messrs. Rillie, Buxton, Kennedy, Aitkin, Fitzsimon, and Foran appointed to the vacancies occurring.

Mr. A. F. Moodie, Inspector of Stock, Slaughtering, and Dairies, has been transferred from Hughenden to Rockhampton.

Racecourse Mill Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Racecourse Central Mill Suppliers' Committee to make a levy of one penny per ton on all sugar-cane hauled over the Silent Grove tramline and supplied to the Racecourse Mill, such levy to be used for administrative purposes of the Silent Grove Cane Growers' Branch of the Racecourse Central Mill Suppliers' Committee.

Fifty per cent. of the growers concerned may petition for a poll on the question of making the levy, which must be lodged with the Department of Agriculture and Stock by 19th November next.

Bingera Mill Levy.

The Bingera Mill Suppliers' Committee is empowered, by Regulations issued recently, to make a levy of one farthing per ton on all sugar-cane loaded at Uping, McIlwraith, and Maroondan Sidings and supplied to the Bingera Mill, such levy to be used for administrative purposes of the Maroondan Branch of the Bingera Mill Suppliers' Committee.

Fifty per cent. of the growers concerned may petition for a poll on the question of making the levy, which must be lodged with the Department of Agriculture and Stock by 19th November next.

Barley Board Hail Insurance Scheme.

Certain amendments of and additions to the Barley Board Hail Insurance Scheme Regulations have been approved. These Regulations were passed in September, 1930, and provide for the payment of compensation to barley growers in respect of losses to crops sustained through hail storm damage. The Barley Board have requested amendments of the above to provide for the covering of crops partially out in ear, the furnishing of growers' returns, and the alteration of the conditions of appointment of umpires and payment to the Board of incidental costs when an appeal is not sustained.

The Wheat Board's Hail Insurance Regulations were similarly amended in September, 1933.

Veterinary Medicines Act Regulations.

On the recommendation of the Veterinary Medicines Board, the Regulations under "*The Veterinary Medicines Act of* 1933," which were issued in February last, have been rescinded, and new regulations issued in lieu thereof.

Banana Levy Extension.

Regulations were issued in September, 1933, under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to make a levy, at the rate of ½d. per case or 1d. per every £2 or part thereof, of the net proceeds realised from the sales of bananas marketed in the bunch from the district between Nerang and the Tweed. A regulation has been issued extending this levy for a further twelve months from 1st January, 1935.

A levy on growers of bananas in the State, excepting growers in the South Coast District (to whom a special levy applies) at the rate of 1d. for every £2 or part thereof of the net proceeds from sales, was approved in December last, and a regulation will empower the Committee of Direction of Fruit Marketing to enforce this levy for a further twelve months from 1st January, 1935.

Stanthorpe Fruit and Vegetable Levy.

A regulation approved under the Fruit Marketing Organisation Acts will empower the Committee of Direction of Fruit Marketing to enforce, for a further twelve months, the levy on growers of fruit and vegetables in the Stanthorpe area. The levy for the past twelve months has been at the rate of 1s. 6d. per ton of fruit and vegetables marketed, with a minimum of 1d. per consignment. The levy for the ensuing period, however, will be at the rate of 1s. 8d. per ton, and will be operative from 15th December, 1934.

Grade Standards for Cavendish Bananas.

An amendment of the Fruit and Vegetable Packing and Grading Regulations issued under "*The Fruit and Vegetables Act of* 1927" has been approved, which provides that the minimum length for the "Sixes" grade for Cavendish Bananas shall be 6 inches.

The regulations at present provide a minimum length of 5½ inches.

Apple Levy Regulation.

A regulation has been issued under the Fruit Marketing Organisation Acts, extending the Apple Levy Regulation, which was issued in November, 1933, for a further period of twelve months from 1st December, 1934. The levy applies to all fruitgrowers in the Stanthorpe district, and is at the rate of 1d. per bushel case of apples grown and marketed from this area. When any apples are railed from any station in the district the levy shall be computed at ¾d. per ton (40 bushel cases or 80 half-bushel cases = 1 ton). Where more than one grower contributes to any consignment, the total amount of levy in respect thereof shall be paid by such growers in proportion to the respective weights of their contributions. A minimum of 1d. shall apply for any one consignment.

Control of "Brumbies."

A Proclamation has been issued under the Diseases in Stock Acts, declaring the Cloncurry Stock District to be a district for the control of brumbies or wild horses for the period from 1st January, 1935, to 30th April, 1935.

New Containers Necessary in Trans-Border Trade.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) stated recently that considerable trouble was being experienced at Wallangarra by the holding-up of fruit and produce exported from Queensland to New South Wales because it was not contained in new cases or bags. Agents or other persons sending fruit and vegetables to New South Wales, if they wished to avoid delay at the border, and perhops outright condemnation of their goods, must use new cases or bags in every instance, as provided by the New South Wales regulations.

An exception only was made in the case of pumpkins and onions, which could be consigned in sound, clean flour or sugar bags, provided they were accompanied by a certificate to this effect.

Papaw Levy Regulation.

A regulation has been issued under the Fruit Marketing Organisation Acts extending for a further twelve months the Papaw Levy enforced in December, 1933. The levy is operated by the Committee of Direction, and is at the rate of one penny for every four cases of papaws, or part thereof, marketed in Queensland.

Regulations under the Stock Foods Acts and the Pest Destroyers Act.

All existing Regulations under "*The Stock Foods Acts,* 1919 *to* 1928," and the Regulations under "*The Pest Destroyers Act of* 1923," have been rescinded, and new Regulations under both Acts have been issued in lieu thereof.

The new Regulations embody many of the original regulations, which have been brought up to date and generally improved.

Credit Still Rising—Australia's Position Abroad.

The report that Australian 5 per cent. loans in New York have reached par is yet another indication of the rehabilitation of Australia's credit abroad, according to an official statement issued from Canberra recently.

In American financial circles the opinion is expressed that the return of values was due to the conviction of the American public "of the complete stability of Australian economic affairs, and not to extraneous circumstances"; it is also pointed out that few other foreign issues in New York enjoy such high prices as Australian stocks.

In three years the market value of Australian 5 per cent. stocks in New York has more than doubled. They reached their lowest point on 15th December, 1931, when 5 per cent. 1957 stocks were quoted at 46. They had been falling steadily to this figure since the beginning of 1929, when they were selling at 96. They have been rising almost continuously ever since, as the following table shows:—

	5 Per cent. 1955.	5 Per cent. 1957.
15th January, 1929	96½	96
15th July, 1929	95½	95½
15th January, 1930	92½	93
16th June, 1930	88¼	88½
15th January, 1931	68	68
15th June, 1931	64¾	65
15th December, 1931	46⅝	46

	5 Per cent. 1955.	5 Per cent. 1957.
15th January, 1932	57½	57¾
15th June, 1932	61	61
17th January, 1933	76¾	77⅛
18th July, 1933	83½	83½
17th January, 1934	94	95
13th June, 1934	94⅛	94¼
7th December, 1934	100	100

Bird Research in Germany.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) announced recently the receipt of a note through the Secretary of State for the Dominions (Mr. J. H. Thomas) from the German Ambassador in London regarding the activities of the German Bird Research Stations.

The Ambassador advises that more than 160,000 wild birds annually have rings attached to their feet at the two stations; the bird observatory of the State Biological Institution in Heligoland, and the Rossitte-Kurische Nehrung Bird Observatory of the Emperor William Society for the promotion of Science. Inscriptions and figures on the rings enable reports to be received from all quarters, and every year several thousand reports, from South Africa to the Arctic Ocean, reach the two bird observatories regarding their ringed birds. This work has results of scientific importance, and reveals quite new discoveries regarding bird migration and other phenomena of bird life. The two observatories are naturally very interested in receiving as large a number as possible of such reports relating to their ringed birds, and on receipt of these reports the precise information is forwarded, not only in regard to the particular case before them, but about their work generally. These observatories are prepared to compile and transmit reports which concern the ringing stations of foreign countries, and willingly supply printed matter relating to the tasks undertaken and the results of their work.

The German Ambassador is desirous that all British authorities and institutions concerned should be acquainted with the activities of their observatories, as scientific work depends on the interest and participation of the widest possible range of people. The Ambassador has given an assurance that the transmission of any notice of the finding of ringed birds to one of the two bird observatories would be gratefully acknowledged.

Egg Board Election.

The voting in connection with the election of a growers' representative for each of the Districts 2, 3, and 4 of the Egg Board resulted as follows:—

	Votes.
District No. 2 (Brisbane North-Redcliffe).	
Matthew Hale Campbell, Albany Creek	101
Raymond Harrison, The Gap, Ashgrove	38
Robert Auburn Chapman, The Gap, Ashgrove	23
District No. 3 (Brisbane South-Cleveland).	
Christian Gisler, Wynnum	130
*Tom Hallick	106
District No. 4 (Moreton).	
Johannes De Vries, Rosewood	104
*Alexander McLauchlan, Boonah	58
Henrich Jacob Jurgensen, Moogerah	42

*Present member.

Messrs. R. B. Corbett, Woombye (chairman), and W. T. Hughes, Middle Ridge, Toowoomba, were returned unopposed for the North Coast and Darling Downs respectively, and Mr. Campbell, a former Chairman of the Board, has been elected in place of the late Mr. A. A. Cousner, who previously represented the Brisbane North district.

The new Board will hold office for a term of one year as from the 1st January.

Dairy Products Stabilisation Board.

By an Order in Council issued on 8th February, 1934, the Dairy Products Stabilisation Board was constituted for a period of twelve months, and comprised the members of the Butter Board together with two members of the Cheese Board. An Order in Council has been issued to-day, amending the constitution of the Board to provide that the Board shall be continued for a further period until the 30th June next.

Rural Topics.

Sunshine Wheat Competition.

At a recent meeting of the Council of the Royal Agricultural Society of Victoria at Melbourne, the secretary reported that he had been advised by Messrs. H. V. McKay Massey Harris Pty. Ltd. that that firm had decided to continue for five years, commencing with the 1935 Melbourne Royal Show, its competition for the best bag of commercial wheat, under conditions similar to those applying to the 1934 competition, with the exception that condition No. 1 be altered to require that the exhibit shall represent a minimum of 50 acres of the variety of wheat exhibited. He had further been informed that prize money in connection with this competition would annually be: First, £8; second, £5; third, £2; with, in addition, £10 to be paid to the society through which the first prize exhibit is entered for the Melbourne Royal Show, also a suitably engraved trophy valued at £5 to be presented to the winner of the first prize. In concluding his report, the secretary drew attention to the fact that the twenty-five entries in this competition at the Centenary Show had represented wheat grown in Western Australia, South Australia, New South Wales, and Victoria.

At the instance of the president, it was unanimously decided to accept with pleasure the promised donation, and the fact that it was intended to continue the competition for five years was noted with appreciation.

This year the winners of the competition were:—1st—R. R. Wilson, Yeelanna, S.A. (variety, Ford); 2nd—A. R. Moulton, Berrigan, N.S.W. (variety, Pusa 4); 3rd—David Johnston, Dookie, Vic. (variety, Wardfir).

Wheatgrower's Records Prove Efficacy of Fallowing.

Striking proof of the efficacy of fallowing is afforded by figures published in a recent issue of the "Agricultural Gazette" of New South Wales. The figures comprise records of yields kept by Mr. W. W. Watson, of Tichborne, near Parkes, and show that, taking into account only strictly comparable years (when both fallow and stubble were cropped during the same year), stubble land averaged 12.84 bushels per acre and fallow land 19.04 bushels per acre, an increase of 48 per cent.

The statistics cover a period of thirty-one years—from 1903 to 1933. There are no exceptional circumstances or favoured conditions connected with Mr. Watson's farm, states the article, and although he farms soundly, he makes no attempt to produce record yields. Furthermore, the soil on which the crops were grown is quite average quality wheat land (a silty loam 9 in. deep, with a clay loam subsoil), while the rainfall and temperatures, as regards both degree and incidence, were such as might have been experienced in any average wheat district.

During the first period, 1903 to 1913, the land had the advantage of the natural humus content maintaining a suitable mechanical condition, and the farm yield from fallowed land was 20.6 bushels per acre. During the second period, 1914 to 1923, the humus content undoubtedly lessened and there was a tendency for the soil to set or cake and to be more difficult to work. This may have affected the yields, which showed a reduction to 17.7 bushels per acre, although the rainfall of the growing season averaged .24 inches greater than during the first period. The tendency for the soil to set, due to the lessening of the humus content, still persists (1934).

After the year 1923, a very appreciable increase in yield took place—namely, 5 bushels per acre for the ten-years' period 1924 to 1933, raising the acre yield to 22.7 bushels, even though the average rainfall during the growing seasons was .72 inches less than for the second period (1914 to 1923). This increased yield is largely attributable to the improved structural condition of the fallowed land, which from 1923 onwards conformed to the principles as at present advocated. This provides for a firm seed-bed, which is essential for a satisfactory germination and is conducive to the best results from superphosphate.

Prior to 1923 fallowed land was merely that which had been ploughed during the previous winter and kept clean until seeding time. Field competitions, commencing in the early twenties, taught the why and the wherefore of the details of fallow workings, and when these were put into practice up went the yields.

In the following table fallow-sown and stubble-sown wheat are combined, the figures thus showing the results of the whole of the wheat-growing operations on Mr. Watson's farm for the different periods. The increases in area cropped and acre yields are very striking. The yield increase is due first to a greater proportion of fallow, supplemented during the last period by a well-prepared fallow, which made soil conditions more suitable for the action of superphosphate,

and also to the introduction of better varieties, pure seed, and the copper carbonate treatment of seed wheat.

Period.	Average Area Sown.	Average Acre Yield.	Increased Yield.	
	Acres.	Bushels.	Bushels.	Per Cent.
1903 to 1913	231·5	14·9	..	..
1914 to 1923	339	16·2	1·3	8.7
1924 to 1933	565	21·1	6·2	41·6

From 1910 to 1925 Mr. Watson kept records of the yields from manured (56 lb. superphosphate per acre) and unmanured areas. Averaging the yields according to the periods shown in the above table, the increases due to the use of superphosphate were as follows:—

Period 1910-13—1.6 bushels per acre increase.

Period 1914-23—1.0 bushels per acre increase.

Period 1924-25—7.0 bushels per acre increase.

The reason for terminating the trials in 1925 was that the increases for 1924 and 1925 were so great as to indicate that further tests were unnecessary. Moreover, there was the loss each year from the unmanured areas to be considered.

The figures show that up till the end of the second period there was no appreciable increase in yield brought about by the use of superphosphate. The reason, no doubt, is that the fallows during those periods were loose and there was no compact seed-bed. With a change in fallowing methods, as demonstrated by field competitions about this time, there was an immediate response to the use of superphospsate, and Mr. Watson still assesses the increase at 6 bushels per acre.

Orchard Notes for March.

THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

During recent weeks there has been a marked increase in the banana thrips population in those districts in which this pest is well established. Growers who consider it necessary to deal with banana thrips are advised that so far nicotine dusts applied at weekly intervals have given the most promising results. The dusts may be applied by means of an inexpensive hand dust gun, or by a rotary duster to which a special flexible outlet pipe has been fitted.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass

has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green.

As blue mould is likely to cause heavy loss in coastal citrus, especially in long distance consignments, special precautions should be taken for minimising this loss. It must be remembered that the blue mould fungus will only attack bruised or wounded fruit. Hence it is necessary to be careful that no injuries are given by the clippers or finger nails during picking. Fruit should be cut and not pulled. Long stalks which may injure other fruit must be avoided.

The fruit must be carefully handled and accurately packed so as to avoid bruising. Any injured fruit should be discarded. In order to reduce the number of fungus spores present in the plantation all waste fruit in the orchard or packing shed should be collected at frequent intervals and destroyed by fire or burying.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to blue mould to be removed prior to despatch.

Growers are reminded that the control of the bronze orange bug is best achieved by spraying with the resin-caustic soda-fish oil mixture normally either late in March or early in April. Applied at this time of the year the spray can give a mortality of 98 per cent. of the bronze bugs which are then present solely in the very young stages. This spray is also very effective against several of the important scale insects infesting citrus.

Red scale is a pest to which citrus growers will shortly have to give attention, it being considered that control is best established from the middle of March to early in April. Fumigation with hydrocyanic acid gas is most effective against red scale, but success may also be achieved with white oils or with the resin-caustic soda-fish oil mixture evolved for the control of the bronze orange bug. Red scale, of course, is pre-eminently a pest of the hotter drier citrus districts.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where the potato crop is subject to Irish blight it is advisable to spray the plants for the control of this disease. Bordeaux mixture of 4.4.40 strength should be applied at least three times at intervals of ten days to a fortnight, commencing when the plants are about six weeks old.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for thirty-six hours and subsequently aerated and stored in airtight containers. The germination of the maize is not normally affected by this treatment if dry and mature when treated.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early-planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

A MISCHIEVOUS DELUSION.

HOW often one hears the word "teething" in the conversations of mothers about their babies! Even in these days many mothers make the mistake of explaining all kinds of illnesses by saying that the baby is teething. "Only teething" is a phrase which has killed many infants, and caused many more to grow up weak and sickly. Healthy babes never show any serious disturbance of health from this cause, though rarely they may be a little restless and dribbling. When there appears to be really some pain in the gums the infant is usually feverish or ill from some other cause, and when this is removed his teeth cease to trouble him. The ailments which have been put down to teething are so many that we can mention only a few of them.

Digestive Upsets.

Perhaps these are the commonest of all. How often we hear loose, green frequent motions calmly referred to as "just teething," and how often we have to explain that the real cause is something the baby has swallowed! His mother has been overfeeding him, or giving him unsuitable food, or letting someone else do so, or he may have picked it up for himself. It happens that the teething age is the weaning age, and it is the time when these mistakes are most common. It is no help to the babe to blame his teeth, though it may comfort a careless mother, and encourage her in her foolish feeding, until the consequences become serious.

Skin Rashes.

One sometimes sees an infant with an irritable rash on the skin, most frequently in the napkin area. This might be prevented by care and cleanliness. When the mischief has been done it may be cured by simple treatment; but if the mother persuades herself that it is "just his teeth," the infant continues to suffer until it becomes so distressed that she has to see a doctor. Even measles have been put down to teething! There is no such thing as a "teething rash."

Feverish Attacks.

Babies and young children easily get feverish from all sorts of causes, but not from their teeth. The most common are the infections known as "common colds" and influenza, but there are many others, such as tonsilitis, measles, scarlet fever, diphtheria, and dengue.

Earache.

Perhaps the most serious mistake of all is to attribute earache to teething. Inflammation of the ear behind the drum is very common in

children and may occur in any of these infections. An older child may be able to tell you about the pain; the young baby cannot. He is fretful and keeps crying and perhaps pulling at his ears. At night he may be restless, rolling his head on the pillow, and frequently waking with sharp cries of pain. Unless promptly treated, an abscess forms and the child may be very sick indeed. When this bursts there is a discharge of matter and the pain is relieved. It is then a serious responsibility to see that the ear heals rapidly and completely and does not become a cause of deafness and a menace to the child's future health.

IN THE FARM KITCHEN.

JAM MAKING.

IN order to get the best results, good fruit in the best condition must be used. The fruit must be ripe, but not over-ripe; jam made from green peaches or imperfect fruit of any kind may be fit to use, but it does not keep well and cannot be compared with a preserve made from properly developed and fine fruit.

All fruits must be thoroughly cleaned.

Citrus fruits, pie melons, and rosellas should be prepared the day before the jam is made.

Apricots, nectarines, and peaches must be carefully peeled and stoned; the kernels of about one-quarter of the stones should be blanched and added to the fruit after the sugar has been added.

Plums must not be peeled; the stones may or may not be removed.

Berries such as gooseberries, mulberries, raspberries, and strawberries should be washed and dried carefully.

Fruit prepared the previous day must be kept in earthenware dishes; piemelons should be sprinkled with a small amount of sugar and allowed to stand for 12 hours; citrus fruits when cut up should be kept in earthenware dishes; a small quantity of water should be added; the seeds and stalks of rosellas are removed and kept in one dish; the remainder of the fruit is placed in another dish.

To all fruits sufficient water is added to prevent the fruit sticking to the preserving pan.

Berries and sugar are placed in the pan together; these fruits should not be stirred in such a way that they are mashed or broken.

In making jam from apricots, citrus fruits, melons, peaches, pears, pineapples, plums, quinces, and rosellas the fruit must be boiled till tender before the sugar is added. The cooking must be slow.

The amount of sugar to be used varies from half a pound to one pound to the pint of cooked pulp; it depends upon (*a*) the kind of fruit; (*b*) its condition.

Scum rises freely while some fruits are being cooked; if it forms a thick toughish layer it must be removed.

The time required for cooking varies; in the case of berries the time must not exceed 30 minutes; apricots, damsons, and firm peaches require one hour; melons, pear, pineapples, and quinces may require two hours before the sugar is added, and from half an hour to one hour afterwards. Cooking is completed if a small portion of the fruit sets when dropped from a spoon on a cool surface.

If jam or jelly is boiled too long it will not set.

Most jams should be bottled and sealed down while hot; jams made from berries should be allowed to cool before bottling if bottled while hot the berries rise to the top of the bottle.

Bottles may be covered with white paper dipped in white of egg or boiled starch; if corks are used they should be dipped in melted wax and forced into the bottle, the top should then be covered with wax. If the bottles have lids, care must be taken to screw them down tightly.

In dry sunny weather jam made from first class fruit, after bottling, may be allowed to stand for 24 hours before being sealed; the bottles should be covered with cheese cloth to keep off dust; a layer of melted parowax should then be poured over the surface in each bottle; the bottles may be covered with paper; preserves treated in this way should keep for months.

Apricot Jam.

Materials—Apricots; 1 lb. crystallised sugar to each pound of fruit weighed without kernels.

Utensils—Knife; dish; preserving pan; saucepan; basin; jam jars; wooden spoon.

Method—

1. Peel apricots; cut them into halves.
2. Remove stones; crack stones and remove kernels.
3. Put ¼ of the kernels into cold water; bring to boil and peel.
4. Put apricots and sugar into a bowl in layers; allow fruit to stand 12 hours.
5. Put fruit and syrup into preserving pan with remainder of sugar, blanched kernels, and water.
6. Allow to cook slowly until apricots are soft and transparent.
7. When slightly cool pour into warm jars.
8. Cover down air-tight.

Note.—Apricot jam may be made without peeling apricots.

Apricot Jam made from Dried Apricots.

Materials—1 lb. dried apricots; 8 cups boiling water; 8 cups sugar; 3 lemons; 6 blanched almonds.

Utensils—Bowl; cup; wooden spoon; squeezer.

Method—

1. Put apricots into a bowl; cover with cold water.
2. Wash fruit well; drain; cut fruit into halves; return apricots to bowl.
3. Cover with boiling water; allow to stand till the apricots are well soaked and plump.
4. Put fruit and water into a preserving pan.
5. Boil till the fruit is clear; add sugar, lemon juice, and almonds.
6. Boil till a small quantity jellies on a saucer.
7. Bottle; seal; cover securely.

Note.—Any dried fruit may be used in this way.

Cape Gooseberry Jam.

Materials—1 lb. of sugar to each pound of fruit.

Utensils—Bowl; sieve; cloth; preserving pan; wooden spoon; jars.

Method—

1. Wash fruit; pick it over carefully; drain and dry fruit.
2. Bruise some ripe berries in the bottom of the preserving pan.
3. Boil for 15 minutes; add remainder of fruit.
4. Add sugar; boil for 1 hour.
5. Let the jam stand in the preserving pan till it is cool.
6. Bottle and cover.

Fig Jam.

Materials—Water; salt; ¾ lb. sugar to each pound of pulp and pint of water; to each pound of figs the juice of 1 lemon and grated rind of ½ a lemon.

Utensils—2 bowls; knife; preserving pan; wooden spoon; lemon squeezer; grater; cup; bottles or jars; corks; covers, or paper.

Method—

1. Cut off half the stem of firm ripe figs; soak them for 12 hours in water to which a little salt has been added.
2. Drain; wash in warm water; split the fruit in halves.
3. Put ¾ lb. sugar and 1 pint of water for each pound of fruit into a preserving pan.
4. Add lemon rind and juice; allow to boil for 10 minutes.
5. Add figs; boil until the fruit is clear.
6. Bottle while hot; cover securely.

Note.—Instead of lemons, pineapple may be added in making this jam, in the proportion of 1 lb. pineapple to 3 lb. figs.

Grape Jam.

Materials—5 lb. grapes, 2½ lb. sugar.

Utensils—Preserving pan; jam jars; wooden spoon; skimmer.

Method—

1. Wash firm, under-ripe grapes.
2. Put fruit and sugar in layers into a preserving pan, allowing ½ lb. of sugar to 1 lb. fruit.
3. Set pan near fire until juice flows.
4. Boil, stirring occasionally.
5. Remove seeds as they rise.
6. When half a teaspoonful jellies on a cold plate, remove from fire.
7. Allow to cool a little; bottle in warm jars; cover down air-tight.

Note.—If the skins are touch and seeds are plentiful, this jam may be rubbed through a coarse sieve.

Isabella Grape Jam.

Materials—Partially ripe Isabella grapes; 1 cup of sugar to each cup of skin and pulp.

Utensils—Preserving pan; bowl; cup; wooden spoon; jars.

Method—

1. Squeeze the pulp out of the skins.
2. Boil the pulp and seed until seeds are separated from pulp.
3. Strain through a colander to remove seeds.
4. Measure skins and trained pulp.
5. Put skins, pulp, and sugar into a preserving pan.
6. Boil until a small quantity jellies on a cool surface.

Melon and Pineapple Jam.

Materials—Piemelon; pineapple; ¾ lb. sugar to each lb. of pulp.

Utensils—Preserving pan; knife; cup; jars.

Method—

1. Cut off pineapple ends; break pulp from core with a fork.
2. Peel melon; cut pulp into pieces, removing seeds.
3. Put melon into a preserving pan; add enough water to keep the pulp from burning.
4. Boil till tender; measure melon and pineapple.
5. Add ¾ cup of sugar to 1 cup of pulp.
6. Boil till a small quantity allowed to drop on a plate sets.
7. Put into jars; cover; label.

CITRUS FRUITS IN THE KITCHEN.

Orange Delight.—Peel and remove the pith of six oranges. Slice thinly in rings, removing the seeds. Arrange in a glass dish or a pyrex, and sprinkle with sugar. Pour a rich boiled custard over the top. Make a meringue with the whites of eggs and head it on top of custard, then garnish with grated orange peel. Set meringue in oven; stand the glass in pan of water while in the oven.

Orange Quarters.—Take three oranges, ½ teaspoon citric acid or juice of two lemons, 2 cups hot water, 1 tablespoon brandy or sherry, little cochineal, and 3 dessertspoons gelatine. Cut oranges in halves, scoop out centre, leaving only the skins; do not break them. Dissolve gelatine, sugar in hot water, add acid or lemon juice, sherry or brandy, and colour half the mixture wtih a few drops of cochineal. When cool pour mixture into shells or skins, and allow to set. Serve on a bed of green leaves.

Orange Compote.—Take ½ pint of water, ½ lb. sugar, and six oranges. Peel oranges, divide into sections, boil sugar and water with shreads of orange peel. Take out the peel and put the orange sections in the syrup and simmer gently ten minutes. Take out and arrange in a glass dish. Add a couple of sheets of gelatine dissolved in water to the syrup and allow syrup to cool a little; then pour over the oranges.

Lemon Trifle.—Items required are 3 cups water, 1½ cups sugar, juice and rind of two lemons, 2 tablespoons arrowroot, and whites of two eggs. Boil the water, sugar, and lemon juice together, then add the blended arrowroot, and when cooked add the stiffly-beaten whites. Serve cold with custard made from yolks.

Orange or Lemon Shape.—Take 3 eggs, ½ oz. gelatine, 2 oz. sugar, cup of hot water, rind of a lemon grated, and juices 2 oranges or lemons. Soak gelatine in hot water, whip whites of eggs till stiff; gradually pour on gelatine and water, beating all the time, beat yolks and add sugar, beat all together. Pour into a wet mould till set.

THE PREPARATION OF CHUTNEYS.

In chutney making there is scope for individual taste and ingenuity in combining different ingredients to give a distinctive flavour. Acid fruits, such as apples, gooseberries, plums, ripe tomatoes and green tomatoes are bases for chutney, and onions, garlic, raisins, dates, sugar, spices, are added according to taste, and the whole mixed with vinegar. The vinegar and the spices are the preserving agents. A good chutney, whatever the ingredients, should be smooth to the palate, and should have a mellow flavour. To obtain this result, it is necessary to cut up all the ingredients finely, and to cook them very slowly for two hours or longer. Long and slow cooking is essential. The addition of raw materials, such as chopped onion or garlic immediately before the chutney is bottled is not advisable, as they destroy the smooth texture and do not give such a good flavour as when cooked with the other ingredients. It is sometimes necessary to put certain ingredients through a sieve, and in that case a hair one should always be used, as metal sieves usually give an unpleasant metallic taste to the chutney. For this reason also, the use of brass, copper, or iron pans during the preparation should be avoided; enamel-lined, monel metal or aluminium pans should be used.

In bottling chutney, the bottles should be clean, dry and hot. The chutney should be bottled hot, and the bottles immediately sealed. If they are to be sealed by means of bladder or parchment paper, however, the chutney should be allowed to cool down before sealing. If corks are used, they should be heated in hot water at about 170 deg. F., and then covered with a circle of grease-proof paper and placed in the bottle or jar. The seal may then be dipped in melted paraffin wax to make the cork airproof. If metal-capped jars are used, wax circles, such as are used for jam, should be inserted between the metal and the chutney.

Gooseberry Chutney Recipes.

(1) 1½ lb. gooseberries	½ oz. salt
3 oz. stoned raisins	¼ oz. mixed spice
5 oz. sugar	¼ oz. crushed mustard seed
4 oz. onions	½ pint vinegar

The onions should be chopped and cooked in a little water till tender, and the water drained off. The gooseberries should be topped, tailed and washed, placed in a pan and the cooked onions, raisins, crushed mustard seed, spice, salt, and vinegar added. The chutney should be simmered for an hour or until it is of thick consistency.

(2) 3 lb. green gooseberries	2 tablespoonsful salt
¾ lb. stoned raisins	½ teaspoonful cayenne
2 lb. brown sugar	½ teaspoonful türmeric powder
2 tablespoonsful mustard seed	3 onions
2 tablespoonsful ground ginger	2 pints vinegar

The onions and raisins should be chopped, the gooseberries topped and tailed, and the mustard seed crushed. All the ingredients should be put into a pan, brought to boiling point and simmered slowly for 1½ hours or until the ingredients are quite tender.

Apple Chutney Recipes.

(1) 6 lb. apples	¼ teaspoonful cayenne
2 lb. onions	2 heads garlic
3 lb. brown sugar	Salt to taste
½ lb. preserving ginger	4 pints vinegar

The apples should be peeled, cored, and cut up into very small pieces and the onions sliced very finely. All the ingredients should be mixed with the vinegar in a preserving pan and boiled gently for 2½ hours or until the chutney becomes very thick.

(2) 7 lb. green apples	1 oz. garlic
2 lb. sultanas	1 teaspoonful spice
4 lb. brown sugar	1 teaspoonful salt
1 lb. preserving ginger	1 quart vinegar
1 teaspoonful cayenne	

The apples should be peeled and sliced and boiled with the brown sugar until fairly thick. The choped ginger, sultanas, garlic, and spices should be added and boiled for twenty minutes. The vinegar should then be mixed in and simmered until the mixture has the requisite consistency.

(3) 4 lb. green apples	½ lb. preserved ginger
1 lb. raisins	1 pint vinegar
½ lb. sugar	

The apples, raisins, and ginger should be chopped very finely; the sugar and vinegar added, brought to boiling point and simmered till of thick consistency.

Marrow and Apple Chutney.

2 lb. marrow	½ lb. sugar
½ lb. shallots	½ oz. bruised whole ginger, chillies, and peppercorns
1 lb. green apples	1½ pints vinegar

The marrow should be cut into small pieces and placed in a basin with salt between each layer, left for twelve hours, and then drained well. The marrow, apples, and onions should be chopped finely; the spices tied in muslin; and the ingredients, except vinegar, put in a saucepan and cooked until tender; the vinegar should then be added, and the chutney cooked until it reaches the consistency of jam.

Green Tomato Chutney Recipes.

(1) 4 lb. green tomatoes	12 red chillies
1 lb. apples	2 oz. garlic
½ lb. stoned raisins	1 lb. shallots
1 lb. brown sugar	1 pint vinegar
½ oz. bruised ginger	

The tomatoes should be sliced, the apples, shallots, and raisins chopped, and all the ingredients placed in a pan, brought to the boil, and cooked until the chutney has the consistency desired.

(2) 5 lb. green tomatoes	1 saltspoonful cayenne
3 lb. green apples	½ teaspoonful cloves and peppercorns
1 lb. moist sugar	¼ saltspoonful cinnamon
1½ lb. chopped onions	1 quart vinegar

The tomatoes should be peeled and sliced, placed in a basin with salt between each layer, left for twelve hours and then drained. They should then be placed in a saucepan with the other ingredients, brought to the boil and simmered until quite tender.

(3) 1 lb. green tomatoes or apples	¼ lb. preserved ginger
½ lb. onions	¼ oz. cayenne
2 bananas	1 oz. salt
½ lb. raisins	¾ lb. brown sugar
	1¼ pints vinegar

The tomatoes and bananas should be sliced, the onions, raisins, and ginger chopped and all ingredients placed in a pan, brought to the boil and simmered slowly until of a thick consistency.

Ripe Tomato Chutney.

Spiced vinegar	12 lb. tomatoes
1 pint vinegar	1½ lb. sugar
¼ oz. cinnamon bark	1½ oz. salt
¼ oz. whole allspice	Pinch cayenne
¼ oz. Penang cloves (stalks only)	¼ oz. paprika
¼ oz. blades of mace	2 fluid oz. Tarragon or Chili vinegar

The spices (tied in muslin) should be added to the vinegar, brought to the boil and allowed to infuse for two hours. The tomatoes should be blanched for one minute in boiling water, the skins and hard cores removed, cut up, and simmered until a thick pulp is obtained. The other ingredients should be added and the strained spiced vinegar. The chutney should be cooked until it is of a very thick consistency.

Date Chutney.

1 lb. stoned dates	½ oz. garlic
¼ lb. stoned raisins	¼ oz. salt
¼ lb. shallots or onions	6 red chillies
¼ lb. sugar	1 pint vinegar

The dates, raisins, and onions should be chopped finely, put in a pan with the other ingredients, and boiled until tender.

TO STIMULATE DECOMPOSITION.

If a compost heap of garden refuse is being formed, a mixture of ammonium sulphate two parts, ground rock phosphate one part, and ground limestone one part is a good decomposing mixture. Use about 2 cwt. per ton of refuse.

TO CLEAN SUPER. BAGS.

Soak in lime water. Sulphuric acid will combine with the lime to form sulphate of lime (gypsum), which is harmless to the bags and almost insoluble. A wash afterwards in clean water should remove practically all the gypsum and leave the bags suitable for most purposes.

TO UNSCREW WATER-TAPS.

Tank-taps can be unscrewed for repairs with little waste of water. Partly fill a strong sugar-bag with sand, tie it firmly to a long pole, and lower into tank till it can be pressed firmly against tap aperture; then unscrew the tap. Pressure of water will force the sandbag into the hole, closing it till the tap has been repaired. In this way also the extra piping can be attached to the tank without waiting till it is empty.

LOOSE LAMP-TOPS.

To fix metal tops on kerosene lamps, scrape all the old cement from brass top and glass reservoir, and wash both well in soapy water to remove the kerosene. Make a smooth paste (about as thick as butter) of plaster of Paris and water, spread it thinly on brass and glass, and put the socket firmly into position. See that it is straight, as the plaster sets quickly. Wipe off any which oozes out on the glass. Mended in the morning, the lamp can be filled and used same night. A tablespoonful of plaster will mend three or four lamps, but mix only for one at a time.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING DECEMBER, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.,	No. of Years' Records.	Dec., 1934.	Dec., 1933.
North Coast.	In.		In.	In.
Atherton	7·60	33	0·69	7·60
Cairns	9·03	52	1·45	7·65
Cardwell	8·44	62	1·35	22·03
Cooktown	6·83	58	1·03	6·23
Herberton	5·87	48	1·94	4·43
Ingham	7·21	42	0·77	18·50
Innisfail	12·20	53	0·39	18·92
Mossman Mill	11·25	21	1·82	11·89
Townsville	5·64	63	0·80	11·41
Central Coast.				
Ayr	4·10	47	0·13	2·38
Bowen	4·48	63	1·50	3·73
Charters Towers	3·38	52	0·22	1·77
Mackay	7·26	63	2·07	5·75
Proserpine	8·11	31	2·29	4·81
St. Lawrence	4·81	63	5·41	3·41
South Coast.				
Biggenden	4·59	35	9·04	6·74
Bundaberg	5·06	51	5·21	9·48
Brisbane	4·95	83	9·82	5·20
Caboolture	5·29	47	7·16	12·39
Childers	5·69	39	4·99	9·96
Crohamhurst	6·92	40	..	16·24
Esk	4·71	47	6·71	5·56
Gayndah	4·15	63	6·84	2·87
Gympie	6·04	64	8·11	9·24
Kilkivan	4·51	55	8·40	6·72
Maryborough	5·09	63	6·96	9·67
Nambour	6·97	38	7·65	13·71
Nanango	3·83	52	5·45	4·21
Rockhampton	4·85	63	3·55	4·00
Woodford	5·69	47	4·00	11·15
Central Highlands.	In.		In.	In.
Clermont	3·92	63	0·91	1·97
Gindie	2·84	35	1·85	0·95
Springsure	3·23	65	5·50	0·86
Darling Downs.				
Dalby	3·23	64	8·43	2·24
Emu Vale	3·49	38	5·37	3·70
Hermitage	2·92	28	3·50	2·40
Jimbour	3·19	46	7·88	1·87
Miles	3·07	49	8·37	3·02
Stanthorpe	3·54	61	6·47	5·14
Toowoomba	4·42	62	7·38	4·43
Warwick	3·40	69	5·07	3·68
Maranoa.				
Roma	2·51	60	4·70	1·18
State Farms, &c.				
Bungeworgorai	2·91	20	4·95	0·92
Gatton College	3·65	35	..	4·48
Kairi	6·52	20	1·80	9·70
Mackay Sugar Experiment Station	8·41	37	1·82	5·72

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—DECEMBER, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·77	93	71	103	7,9,27	60	7	103	3
Herberton	..	87	62	96	26	49	11	194	2
Rockhampton	29·82	91	69	96	30,31	61	3	355	10
Brisbane	29·85	82	65	97	31	58	11	982	16
Darling Downs.									
Dalby	29·82	84	60	92	8	44	2	843	11
Stanthorpe	..	77	54	87	19	40	2	647	15
Toowoomba	..	78	58	86	8,16,20	47	1	738	14
Mid-Interior.									
Georgetown	29·79	99	72	106	26,31	61	11, 31	35	2
Longreach	29·78	101	68	109	23	54	1	5	1
Mitchell	29·81	91	61	99	8,17,18, 20	49	1	165	8
Western.									
Burketown	29·79	99	76	110	26	68	3	0	..
Boulia	29·80	101	72	112	23	58	2, 3	0	..
Thargomindah	29·80	95	70	110	16,17	58	9, 10	85	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February. 1935.		March. 1935.		MOONRISE. Feb., 1935.	MOONRISE. Mar., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·25	6·46	5·45	6·25	2·10	12·56
2	5·26	6·45	5·45	6·24	3·16	2·2
3	5·27	6·45	5·46	6·23	4·26	3·12
4	5·27	6·44	5·46	6·21	5·41	4·22
5	5·28	6·43	5·47	6·20	6·46	5·31
6	5·29	6·43	5·48	6·19	7·56	6·37
7	5·30	6·42	5·48	6·18	9·1	7·44
8	5·30	6·42	5·49	6·17	10·7	8·51
9	5·31	6·41	5·50	6·16	11·8	9·57
10	5·32	6·40	5·51	6·15	12·13	11·1
					p.m.	
11	5·33	6·39	5·51	6·13	1·12	12 noon
						p.m.
12	5·33	6·39	5·52	6·12	2·9	12·57
13	5·34	6·38	5·52	6·11	3·3	1·47
14	5·35	6·37	5·53	6·10	3·52	2·38
15	5·36	6·36	5·54	6·9	4·36	3·15
16	5·36	6·36	5·54	6·8	5·14	3·49
17	5·37	6·35	5·55	6·7	5·46	4·21
18	5·38	6·34	5·55	6·6	6 18	4·48
19	5·39	6·34	5·56	6·5	6·48	5·17
20	5·39	6·33	5·56	6·4	7·17	5·47
21	5·40	6·33	5·57	6·3	7·45	6·19
22	5·41	6·32	5·57	6·2	8·13	6·51
23	5·42	6·31	5·58	6·1	8·48	7·25
24	5·42	6·30	5·58	6·0	9·24	8·5
25	5·43	6·29	5·59	5·59	10·6	8·53
26	5·43	6·28	5·59	5·58	10·56	9·47
27	5·44	6·27	6·0	5·57	11·53	10·46
28	5·44	6·26	6·0	5·55	..	11·48
29			6·1	5·54		a.m.
30			6·1	5·53		12·54
31			6·2	5·52		2·4

Phases of the Moon, Occultations, &c.

4 Feb.	●	New Moon	2 27 a.m.
10 ,,	☾	First Quarter	7 25 p.m
18 ,,	○	Full Moon	9 17 a.m.
26 ,,	☽	Last Quarter	8 14 p.m.

Perigee, 4th February, at 9.24 a.m.
Apogee, 18th February, at 9.12 p.m.

Mercury, on 1st February, will be at its greatest elongation, 18 degrees east of the Sun. This will enable it to remain above the western horizon almost an hour after sunset.

Although a partial eclipse of the Sun will occur about 3 o'clock in the morning of the 4th, it will, of course, be invisible in Australia, but at Montreal, where it will occur about midday on the 3rd, local time, not quite half of the Sun's face will be obscured by the Moon.

The Moon will pass from west to ease of Saturn 4 degrees on its northern side at 4 a.m. on the 5th, 2¾ hours before rising at Warwick. Five hours later it will pass 2 degrees north of Mercury and 5 degrees to the northward of Venus at 1 p.m. on the 5th.

Mercury will get almost in a line with the Sun on the 17th, but being 3 degrees farther north there will be no possibility of a transit.

Saturn, on the 20th, will be on the far side of its orbit, about 886 million miles beyond the Sun, and almost in a line with it, and, of course, entirely invisible.

On the 25th, when the Moon rises at Warwick (10.6 p.m.), it will be followed 13 minutes later by Jupiter, 6 degrees further north.

When Mars reaches Right Ascension 13.35 on the 27th, it will become stationary and then retrograde, getting back to Right Ascension 13.30 on the 14th March, almost the same place as on 13th February.

Mercury sets at 7.44 p.m. on the 1st, and at 6.46 p.m. on the 14th.

Venus sets at 7.48 p.m. on the 1st, and at 7.54 p.m. on the 14th.

Mars rises at 10.16 p.m. on the 1st, and at 9.34 p.m. on the 14th.

Jupiter rises at 11.46 p.m. on the 1st, and at 11.0 p.m. on the 14th.

Saturn sets at 7.46 p.m. on the 1st, and at 6.59 p.m. on the 14th.

The Southern Cross, which was at VI. at 6 p.m. on 1st January, and did not come into view till about 9 p.m., will be two hours earlier this month, and be visible all night.

5 March	●	New Moon	12 40 p.m.
12 ,,	☾	First Quarter	10 30 a.m.
20 ,,	○	Full Moon	3 31 p.m.
28 ,,	☽	Last Quarter	6 51 a.m.

Perigee, 4th March, at 9.54 p.m.
Apogee, 17th March, at 2.36 p.m.

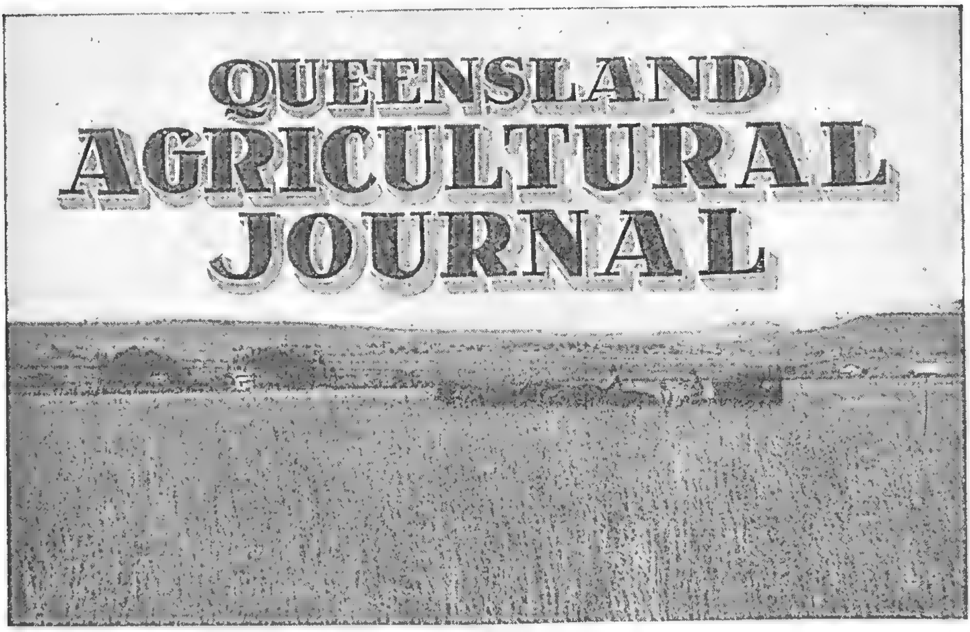
For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



VOL XLIII. 1 MARCH, 1935. PART 3

Event and Comment.

Minister's Talk to Dairy Leaders.

"MY experience has been that we have achieved more by taking the farmers into our confidence, by showing them the road we are trying to tread, by inviting their co-operation and assistance in co-ordinating the activities of the Department with those of rural industry. Generally speaking, we wish to link up the work done on the farm, at the factory, and within the Department of Agriculture and Stock." With those remarks, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, prefaced a very interesting address to dairy leaders of several local producers' associations who, at the invitation of his Department, had assembled in Brisbane last month to undergo a brief course of instruction in departmental activities, in relation to the dairying industry particularly.

Continuing, Mr. Bulcock said that in the course of their visit to the several branches of his Department the dairy leaders would be afforded every opportunity of meeting his technical officers, and of seeing many things of interest and of great importance to their industry. Departmental officers, as employees of the State, would give them every facility for observing something of the work of the Department and answer every reasonable inquiry. Although everything at present possible to assist or direct the dairying industry was being done, he would welcome any suggestions for improving the position and conditions of the industry the dairy leaders might be prepared to submit. There were

some things, of course, entirely within the control of the dairy farmers themselves, especially in respect of hygiene and sanitation, and those things he commended for their attention as members of local producers' associations. Then there were pathological problems to be faced—problems of the utmost economic importance—and in that work they were assured of the practical assistance of veterinary and other officers. While many farmers might be prepared to do everything possible within their means to combat stock diseases, the checking or eradication of those diseases was obviously a matter for community rather than individual effort. The co-operation of every unit in the industry was therefore most desirable. It had been thought, in some instances, that his Department had been too rigorous in its campaign for better dairy cattle and for improved methods generally, but he believed that his hearers would agree with him—privately, at any rate—that there was a tremendous amount of avoidable economic loss in the dairying industry. It was their business, as far as practicable, to assist in the prevention of a continuance of that loss.

As an example of the necessity for full co-operation of all engaged in the industry, whether as producers or technologists, Mr. Bulcock cited the case of Denmark. That country, he said, delivered 136,000 tons of butter on to the British market every year, although it was Britain's tenth best customer, while Australia was Britain's third best customer for manufactured goods. In face of that fact, however, there was a movement in progress to restrict still further the imports of Australian dairy produce into Great Britain. There was every reason to feel concerned, he said, with the effect on Dominion trade of the seven or eight trade treaties entered into by Great Britain since the Imperial Conference at Ottawa with certain European countries, and which involved trade concessions to them on the British market. Apparently Denmark, to mention one of those countries, realised that next year when the existing treaty terminated the whole question of Britain's imports would be reviewed, and so was busy culling out her dairy herds with the object of achieving the highest degree of economy possible in dairy production. In the near future, therefore, Danish exporters would be able to tell the British consumer that they were in a position to offer butter with a guarantee that it was the product of disease-free cows bred, fed, and housed under the most hygienic conditions. In Mr. Bulcock's opinion, it was one of the cleverest forms of trade propaganda, based on a determined clean-up campaign in the Danish dairying industry, that had come under his notice. To the Australian producer the moral was obvious. Brains had to be met with brains, and the only effective reply to a trade competitor was the supply of an equal or better quality product.

Work of the Animal Health Station.

CONTINUING, Mr. Bulcock said that his Department was persisting in its efforts in the direction of the eradication, or at least control, of stock diseases within the State. Until recent years, the Animal Health Station at Yeerongpilly had been merely a place for the preparation of vaccines, toxins, and anti-toxins, and the treatment of redwater in cattle. It seemed to him when he assumed office that the station could be made of much greater service to stockowners, and to that end the work of the station had been reorganised and extended. A veterinary staff had been appointed and modern equipment provided. A system of refresher courses in animal husbandry for the field staff of the Dairy Branch had been instituted, so that the most recent knowledge in dairy

science might be made available to the farmer through the instructional and inspectional services. A disease-free herd campaign had been inaugurated, which, through the co-operation of the dairy farmers, had already produced sound results. The general veterinary staff of the Department had been greatly strengthened and, with the assistance of the farmers, they should be able to build up a system of dairy practice in Queensland which they could all regard with very great pride. In its relation to an industry of first importance in the economy of this country, every effort that had been made and planned, based as it was on modern dairy science and practice, had been well worth while.

High Quality in Dairy Products Demanded.

DISCUSSING the needs of the export market, Mr. Bulcock said that the Government had in view the establishment of a dairy laboratory to serve the needs of the industry. In that laboratory would be installed the most modern equipment. It was regarded as sound economy to extend scientific research in relation to such an important Queensland industry. No single unit of the industry, however, could alone solve its problems of either production or marketing; the co-operation of all—the Department, the factory, and the farm—was essential. After all, it was the producer who formed the foundation of any industry, and all the organisation and all the planned schemes would be useless without the co-operation of the people who were primarily concerned. That was why he had invited leaders of the dairying industry to visit his department and see for themselves what was being done for the men on the land, and so appreciate the call for the farmers' earnest co-operation. With animal-disease control, the production of the highest quality butter and cheese, co-ordination among every section and the co-operation of the producer, they would have nothing whatever to fear in the future of the dairying industry in Queensland.

Selling our Scenery.

EVERY district has some natural feature or some charm of landscape that would attract visitors from other parts of the State, and also from other parts of the Commonwealth, if they knew anything about it. So the question presents itself—a question well worth consideration by every local association—why not sell our scenery? Local patriotism—not to be confounded, of course, with narrow provincialism—can be a very fine thing and, rightly expressed with befitting enterprise, can have a definite material value. Tasmania, for instance, is said to derive more than a millions pounds in money every year from her tourist trade. The result is that the Tasmanian is definitely tourist-minded. He "boosts" his State wherever he goes, while the home-staying Apple Islander has developed a natural courtesy and kindliness that the stranger within his gates remembers long after the landscape delights of a beautiful country have become blurred through their mergence with later memories. According to the Canadian Bureau of Statistics, in 1929 tourists spent in the Dominion no less than £61,875,000. That enormous sum, however, shrunk during lean years to £22,000,000 in 1933. Of the Canadian tourist traffic the Bureau says: "Of all our export commodities only wheat and paper rank with it in importance," and since the fall in price of those commodities "it has surpassed both." Plainly, then, a country blessed with all the natural advantages—some of them unique—which Queensland possesses is blind to its own interests if it does not do everything in its power to attract visitors.

Root Knot Nematode and its Control.

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

CERTAIN species of nematodes or eelworms attack living plant tissue, some are parasitic on animals, while others are predaceous on nematodes themselves. The species of outstanding importance in Queensland is the common root knot nematode, so called because of the characteristic swellings produced on the roots of infested plants. This species reaches its maximum abundance in light sandy soils in the warmer portions of the State, heavy soils being much less favourable to its development, while soils that are either generally very wet or abnormally dry are usually lightly infested. Many important economic plants are susceptible to attack, but most grasses, maize, wheat, barley, broom millet, sorghum, peanuts, velvet beans, and certain varieties of cowpeas are either immune to attack or the infestation thereof is so slight as to be of no consequence. Heavy infestation in highly susceptible plants produces a marked dwarfing as a result of the disorganisation of the normal functions of the root system. Furthermore, such plants are decidedly less healthy in appearance than unifested plants; they wilt readily during hot dry weather, and generally the duration of their productive life is greatly curtailed.

Life History and Habits.

The female nematode assumes a pear-shaped appearance when full grown and then measures one-thirtieth of an inch in breadth, but the male nematode retains its worm-like appearance throughout life. The extremely minute eggs, of which as many as 500 may be laid by a single female, have a very tough shell which assists survival should adverse conditions prevail in the soil. The small thread-like nematodes emerge from these eggs at the end of the usual incubation period, and move about the soil in search of suitable host plants. These having been located the nematodes select young feeding roots and enter them generally near the tips. Feeding proceeds within the root tissue, and as a reaction to the infestation of the roots the very characteristic galls are produced. Swollen malformed areas occur throughout the root system of infested plants (Plate 107, figs. 1 and 3), and the swellings may either occur singly and only here and there on the roots or, on the other hand, the infestation may be of such intensity as to give practically the whole root system a swollen appearance, some roots bearing a marked resemblance to a chain of beads. Infestation is not always confined to the root system, for in the case of potatoes the tubers may be badly attacked, the surface thereof bearing a number of swellings (Plate 107, fig. 2) which impart a distinctly pimply appearance to the potatoes.

Other swellings may occur on the roots of plants belonging to the pea and bean family, but these are quite different in origin, being the beneficial bacterial nodules (Plate 107, fig. 4) characteristic of that group of plants. They are usually spherical in shape and small or moderate in size and can generally be easily detached from the sides of the roots on which they have developed. The nematode root galls cannot be so removed and are, of course, wholly undesirable. Both bacterial nodules and nematode root galls may occur on the roots of members of the pea and bean family.

FIG. 1.

FIG 2

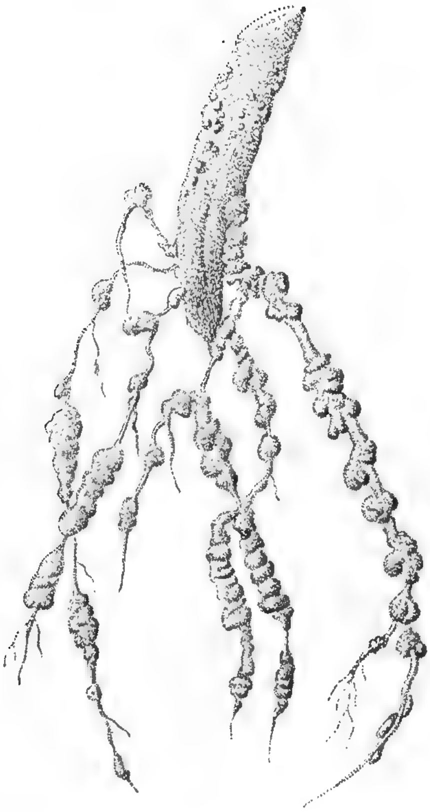


FIG. 3.

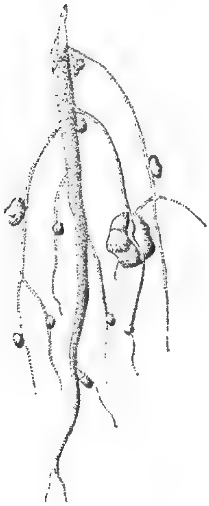


FIG. 4.

I. W. Helmsing 1927.

PLATE 107.—ROOT KNOT NEMATODE.

Fig. 1.—Nematode galls on Strawberry roots.
Fig. 2.—Nematode-infested Potato.
Fig. 3.—Tomato root infested by Nematodes.
Fig. 4.—Bacterial Nodules on roots of Lupin.
(All half natural size.)

Control.

The control of the root knot nematode is an extremely difficult matter, because for the greater part of its life the nematode is securely entrenched within the tissue of its host plant. It does, of course, occur in the soil apart from the root tissue, and soil fumigation can dispose of large numbers of the temporarily free living nematodes. So far, however, no system of soil fumigation has been used in this State which would be economically practicable, as well as effective on an ordinary field scale.

Treatment of infested plants being quite out of the question, control should aim at maintaining such plants in as healthy a condition as possible, at reducing the nematode population in infested land and keeping uninfested country free from this serious pest. Thorough cultivation and heavy manuring frequently enable infested plants to produce quite a satisfactory crop, particularly if it is a rapidly maturing one, such as tobacco. However, plants that have been infested in the seed-bed do not generally respond to such treatment, and such seedlings are better discarded and destroyed, transplanting being restricted to plants showing no outward sign of infestation. Seed-beds in districts known to be infested are best established, when practicable, on new ground, and a further seed-bed precaution sometimes adopted in infested areas is the steam sterilization of the soil prior to the sowing of the seed. When an infested crop has been harvested the uprooted crop residues should be destroyed by burning where such a procedure can be adopted, for by doing so the nematode population available for the infestation of the succeeding crop should be appreciably reduced.

A further reduction may be achieved by rotating immune crops with susceptible crops, but the farmer must remember that infestation will inevitably recur, eradication being an impossibility. In cases where susceptible land is free from infestation every effort should be made to keep it so, and, if possible, any seedlings required for planting thereon should be grown on the property. If they have to be obtained elsewhere they should be carefully examined for the presence of the eelworms, and if infestation is present it is wiser not to use such seedlings on clean properties. Nematodes do not travel far in the soil, moving only a few feet each year, hence their rapid dissemination to and in new areas is due to their being transported on implements, on the feet of workers and stock, in running water, and, of course, in seedlings, seed potatoes, or nursery stock. These modes of dissemination should be kept in mind when an effort is being made to maintain a clean property free from infestation.

SHEEP-DRENCHING AIDS.

If you don't want your fingers chewed when dosing the sheep here is a simple preventive. Get a piece of No. 8 wire and bend it into the form of a hairpin 9 inches long and 1½ inches wide at the bow end. With the sheep held by your knees insert the bow between the sheep's lips, and bring it down over the tongue behind the front teeth. Then with the right hand lift its upper jaw, and the man with the squirt, or the capsule, will have no difficulty in placing the dose well behind the root of the tongue.

The Bronze Orange Bug.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

THE bronze orange bug, *Rhœcocoris sulciventris* Stål, was recorded as a Queensland insect in 1868, and for almost fifty years it has been known as a pest of citrus in this State. Formerly the insect was named *Oncoscelis sulciventris,* and a good deal of what has been written regarding the pest is to be found under that name.

The vernacular name, bronze orange bug, is almost universally used in those Queensland citrus districts where the pest occurs. In some publications the name orange tree bug is used, but this is unsuitable, as it fails to distinguish the species from several others found on the same host.

Distribution.

The distribution of the insect is obviously controlled largely by climatic influences. The species is found in northern New South Wales, and extends into Queensland as far as the Gympie district, but north of Gympie tropical conditions become more marked and the insect does not occur there. In the same way more than about 60 miles from the coast the bug quickly becomes rare and is heard of as a pest only in cooler parts, such as on the Great Dividing Range, particularly in the vicinity of Toowoomba. Even within the small section of south-eastern Queensland just outlined the bug is a major pest only in places of comparatively low average temperatures, notably on the Blackall Range and at Tamborine Mountain.

The bug is easily transported in the second nymphal stage. It is a common practice for pineapple growers to pack their fruit in grasses such as Red Natal and Blady taken from under or near citrus trees, and quite frequently second stage nymphs are found crawling amongst this grass, and no doubt many are transported about the State in this way. However, the climatic barrier appears to be insuperable, and there is no reason to fear any extension of the area of distribution of the pest.

Economic Importance.

Within the area in which it occurs the insect is responsible for heavy damage to individual orchards in every part, but in only two large districts, the Blackall Range from Montville to Mapleton and Tamborine Mountain, is it a major pest of every orchard. It is a general pest of lesser importance in the vicinity of Palmwoods and Nambour, and to a lesser extent in the Redland Bay district. The bug is essentially a pest of vigorous trees, and in the two districts mentioned as being most troubled by it only orchards in poor condition escape severe depredation unless control measures be adopted.

It is difficult to assess the damage attributed to the pest, as the indirect loss of fruit cannot be calculated with any degree of accuracy. The ill-effects may be described as cumulative, for not only is young fruit removed but the wood which is to bear the following crop is reduced or even eliminated. Further, after a few years of heavy infestation the trees produce little growth and become harsh and incapable of carrying a crop. From a comparison of the yield of infested trees with what might reasonably be expected, it is considered that 20 per

cent. loss is about the average for badly infested orchards, and 30 per cent. loss by no means uncommon. Habitually infested orchards soon become uncommercial.

Host Plants and Varietal Preference.

The bronze orange bug is found on all varieties of citrus grown commercially in the districts concerned. Oranges appear to be preferred to lemons, or mandarins with the possible exception of the Fewtrell Early variety. However, the presence of young soft growth is all that is necessary to make any variety acceptable to the pest.

In addition to cultivated varieties the bug feeds and breeds on *Citrus australis,* the native orange, or wild lime as it is sometimes called. However, the numbers to be found on the indigenous host are very small. A few score individuals on this tree constitutes a large population, whilst 2,000 bugs on one orchard tree is common, and on many occasions more than 5,000 individuals have been taken from one orange tree. Further, *Citrus australis,* though not uncommon, does not occur in very large numbers. Migration certainly does take place from the native host to orchard trees, but the number of bugs so arriving in the orchard is certainly insignificant compared with the number bred in the orchard. It has been noticed repeatedly that after a determined clean-up on the part of a section of orchardists it is several years before the bugs again assume major pest proportions in the immediate vicinity. This would not be expected if migration were a major factor.

Adults, eggs, and first and second stage nymphs are sometimes observed on other plants growing in close proximity to citrus trees, but all the evidence shows that none of these other plants serve as hosts on which the insect can feed.

Description.

The bronze orange bug, in common with other members of the group of insects to which it belongs, namely the Heteroptera, has a life cycle consisting of seven stages—the egg, five nymphal instars, and the adult. Growth takes place by a series of moults, the old skin being cast off and its place taken by a new one, often differing considerably in colour and other characteristics.

The Egg.

The eggs (Plate 108, fig. 1) are laid on the leaves as a general rule; but occasionally batches may be found on fruits or, as has been mentioned, on other nearby plants. Both surfaces of the leaves are used as oviposition sites. The eggs are laid in batches of fourteen in a characteristic formation. Each batch is laid in four lines, the two outside rows having three eggs each and the two inside ones four each. Occasionally incomplete batches are found, but these are due no doubt to the female having been disturbed during oviposition. So far as has been observed no more than fourteen eggs are ever placed in one batch. The eggs are fixed to the surface by a fluid which covers them when they are laid. Commonly the egg shells remain attached to the leaf for many weeks, or even months, after hatching has taken place.

The eggs are spherical in shape, shiny and light green to almost yellow in colour. They are relatively large, being little less than one-eighth of an inch in diameter. Several batches may be found on one leaf.

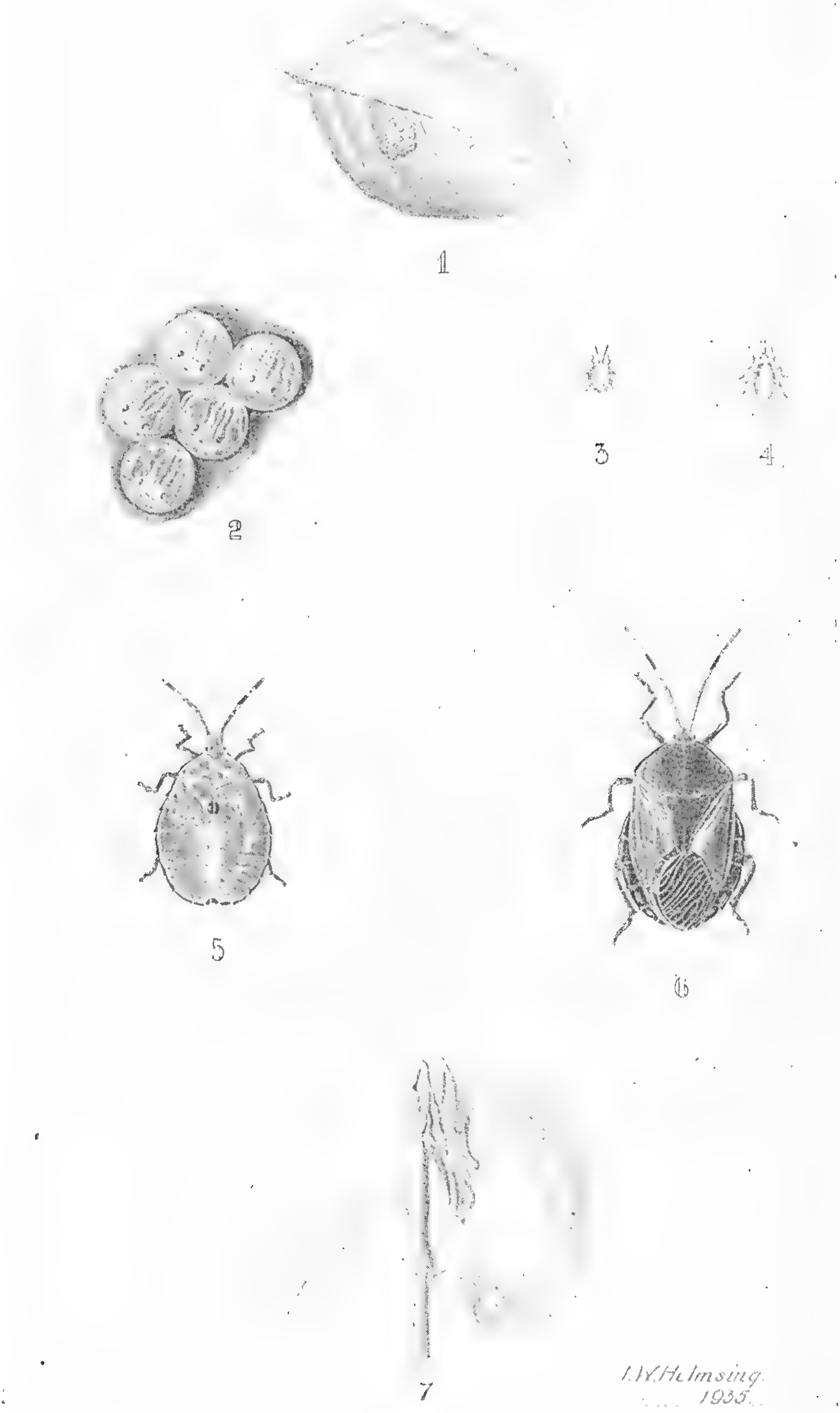


Plate 108.

The Bronze Orange Bug (*Rhœcocoris sulciventris* Stål.).

Fig. 1. Egg cluster, half natural size.
Fig. 2. Eggs about to hatch (×4).
Fig. 3. First instar, natural size.
Fig. 4. Second instar, natural size.
Fig. 5. Fifth instar, natural size.
Fig. 6. Adult, natural size.
Fig. 7. Young citrus twig damaged by bug, half natural size.

Nymphal Instars.

Insofar as orchardists are concerned the nymphal stages of the pest may be divided conveniently into two groups. Group 1 consists of those stages which can be efficiently controlled by spraying, but against which no mechanical method known can be made satisfactory. There are two stages in this group—namely, the first and second instars. The bugs of this group are small, comparatively inactive, and do not feed but spend the whole of their time sheltering amongst the foliage until conditions of weather and tree growth induce further development. In the earliest stage (Plate 108, fig. 3) they are about three-sixteenths of an inch long, roughly oval in outline, and though capable of quick movement remain for the most part in groups generally close to the site at which they were hatched. They are rather fat-looking, slightly convex when viewed from above, and are glossy green in colour.

On moulting to the second instar (Plate 108, fig. 4) the bugs measure up to one-quarter of an inch in length and are still roughly oval in outline. Now, however, they are flat and very thin, and this stage is commonly referred to as the "tissue paper" stage, a name which aptly describes the general appearance. The colour may be light green, yellow or greyish, the latter colour predominating towards the end of winter. In this stage the insects are most difficult to find on the leaves where they lie closely apposed to the lower surface. Soon after moulting to the second stage the insects scatter to a greater or lesser degree. Mostly three or four remain on a leaf, but thirty are not uncommon, and as many as seventy have been noted.

Group 2 contains those bugs which are not efficiently controlled by spraying, but which, owing to the ease with which they can be dislodged from the tree, may be combated with some success by mechanical means. This group consists of the third, fourth, and fifth instars. These are larger in size, feed voraciously on outside twigs, and are in consequence more congregated than previously.

In the third stage the bugs are approximately three-eighths of an inch long, and by the time the fifth stage (Plate 108, fig. 5) is reached the length may be as much as seven-eighths of an inch. They remain roughly oval in outline, and the most conspicuous character is the colour. At first they are shining green, but this disappears and lighter green, orange, and brilliant pink forms are seen. They are now readily observed and their presence is made obvious by the malodorous secretion which they emit on the slightest provocation.

The Adult.

The adult bronze orange bugs (Plate 108, fig. 6) are robust insects measuring an inch in length and five-eighths of an inch across the greatest width of the abdomen. When first moulted from the fifth instar they are light bronze above and reddish-brown beneath. As they grow older the colour darkens and finally is black above and dark brown beneath. The legs are reddish-brown becoming lighter and almost red at the extremities. The head is small and the eyes lighter brown than the surrounding parts and rather conspicuous. The antennæ or feelers are reddish-brown at the base, but the second last and the last joints are orange-coloured. If the wings be pulled aside the upper surface of the abdomen is seen to be orange or reddish towards the centre and dark

brown to black at the margins. The adults can fly strongly, and though they remain quiet most of the day it is not uncommon to see them flying about from tree to tree.

Allied Insects.

There is no likelihood of the bronze orange bug being confused with any other species found on citrus in this State. A very similar bug, *Stilida indecora* Stål, has been recorded from citrus in New South Wales, but this species has not been found on citrus in Queensland. All the other species which attack citrus in Queensland are smaller than the bronze orange bug, and furthermore they are green in colour when adult.

Life History and Habits.

The bronze orange bug has but one complete life cycle each year. Eggs are laid in February and March, and even as late as April in some years. These hatch fairly quickly, the minimum time recorded being eight days. The young on hatching remain for the most part congregated until the time of the first moult, which usually takes place in five or six days after hatching. The second stage bugs then scatter more or less and take up positions on the under surfaces of the leaves in protected places. The bugs remain in this position for almost seven months, and during the whole of this time they do not feed. Nymphs of this stage have been kept alive in containers without food or even moisture for several months. High temperatures appear to be the only factor adversely affecting the insect in this stage, and on warm days it has frequently been observed that half an hour of direct sunlight proves fatal to the great majority. In this stage the insect clings very tightly to the leaves and cannot be dislodged by even very strong jarring of the limbs.

Thus the winter is passed in a quiescent state, and though thousands may be present on a tree it suffers no ill-effect. Even the closest examination at this time may fail to give any idea of the degree of infestation, and it is useless orchardists making examinations at this time to decide whether or not spraying is necessary.

With the return of warm conditions the tree begins to make growth and the bugs become active. Feeding is commenced and the third instar nymphs begin to appear in numbers early in September. The bugs are now more conspicuous as they become brightly coloured and larger and move to the outside twig growth to feed. Even before they are observed their presence is obvious on account of the foul smell associated with them from this time onwards.

Each of the last three instars occupy about three weeks or a little longer, and thus the adult stage may be reached in November. Adults are, however, as a rule not numerous until early in December. December and January are passed in feeding and mating, and eggs are again deposited in February as described earlier. No data has been obtained as to the number of eggs each female may lay, as it is rather difficult to keep the adults alive in capativity, and in all cases in which this was attempted death was obviously premature. It is, however, certain that each female can lay several batches, each consisting of fourteen eggs.

For the most part the bugs feed on the tenderest twig growth available, and the insect is thus essentially a pest of vigorous trees. To a certain extent very tender fruit, and the stalks of fruit, leaves, and flowers are also chosen as feeding sites. Attacked fruit, leaves,

and flowers are quickly shed and young twigs wither and die back, generally to the limit of hardened growth. Heavily attacked trees occasionally have practically the whole of the young fruit removed and, in addition, the wood which should carry the following crop also weakened or destroyed. Trees which carry many bugs for several successive years lose vigour and ultimately make little new growth. Furthermore, what growth is produced is usually short and incapable of carrying even a fair crop.

The bugs prefer the cooler side of the tree and the higher branches, and thus it is in these positions that the greatest amount of injury is usually noted.

When dislodged from the tree the nymphs, particularly the older stage ones, immediately turn and crawl towards the base of the tree. If undeterred they reach the base quickly and return up the trunk to the extremities of the branches.

The secretion is an almost colourless volatile liquid which the bugs can squirt a distance of as much as 2 feet. It is very corrosive and causes severe burning when it lodges on tender parts, temporary blindness often resulting when the fluid strikes the eye. The fifth stage nymphs and adults are quite aggressive in discharging this secretion. On the approach of a person they often manoeuvre their bodies so that they can eject the maximum amount of fluid in the direction of the intruder. They do not wait to be touched, but will discharge at a person merely passing within a foot or two of the twig on which they happen to be.

Control.

The all-important subject of control will be discussed under two headings—namely, control by the incidence of natural enemies and by artificial means.

A. Natural Enemies.

Though a number of insects prey on the pest the degree of natural control exercised by these in the orchard is very small and of little or no material value. Egg parasites are rare and predatory bugs, chiefly Asopidæ, are also uncommon, by far the greatest degree of natural control being exercised by insectivorous birds. Several species of birds are concerned, and where they are allowed to work unmolested they frequently do excellent work. Orchardists should protect these useful birds as far as they possibly can.

B. Artificial Control.

Artificial control can be accomplished either by mechanical means or by spraying. Of the two the spraying method is much to be preferred on commercial orchards, not only because it is so much more efficient as an actual control, but also because when correctly carried out the other effects of the spray are wholly beneficial, whereas the other effects of the best mechanical method are injurious to the tree.

Mechanical Means.

The mechanical method depends for its success on the fact that when in the last three nymphal instars the bugs can be dislodged readily from the trees. In this method the tree is jarred by the main limbs, each being tapped sharply with a padded mallet. The most satisfactory mallet is one of wood 12 to 18 inches long, so shaped that it can be

easily held in the hand and at the same time have most of the weight towards the head or striking end. The striking end should be wrapped in rubber or some such material to prevent excessive bruising or breaking of the bark. The limbs should be struck in rapid succession rather than heavily, as not only does this minimise the injury but is more effective in bringing the bugs to the ground. Prior to the banging the soil around the base of the trunk should be hilled up so as to form a smooth cone with sharply inclined sides. A strip of galvanised iron or other such material about 7 inches wide may be substituted for the cone. The strip is arranged so as to form a barrier around the trunk. On falling to the ground the bugs at once commence to crawl towards the trunk. Their progress is impeded by the barrier of earth or other material, and thus become congregated and can be dealt with easily. The destruction of the bugs may be carried out in any convenient way. Burning with blow lamps while they are still on the ground is the most usual method employed, but placing them in a container half filled with kerosene and water or other poisonous liquid is also practised. Burying cannot be recommended.

This method can be employed only when the bugs are in the third, fourth, or fifth instar. In practice it is not wise to wait much longer than is actually necessary, for the breeding is not quite even, and if the work is left until too late in the year a proportion of the bugs may have become adults and thus escape.

Tapping of the trees has little to commend it. It cannot be expected to give more than about 70 per cent. control, and quite frequently it gives considerably small percentages. Apart from the low efficiency, the operation, no matter how carefully carried out, always results in injury to the trees. Bruising and breaking of the bark favours the entrance of borers and diseases. Again, the tapping must be done at that period of the year when the bug has already done a certain amount of damage, and also at a time when the crop is just setting. The result is that in every case an appreciable amount of fruit is lost. It is impossible to carry out the work thoroughly without causing some of these ill effects.

Handpicking is sometimes employed, but it is very slow unpleasant work and is far from efficient except on very small trees. Unfortunately it is not work that can be given to children, as the bug secretion is too severe on tender skin and the eyes.

Mechanical methods then are to be recommended only when special circumstances render the use of the spray impracticable or not económical. This should vary rarely, if ever, happen on a commercial orchard. The only value mechanical methods have in ordinary circumstances is for use on single garden trees, and even with these it would generally be found better to use the spray.

Spraying Method.

The formula of the spray for use against the bronze orange bug is as follows:—10 lb. resin, 3 lb. caustic soda of good commercial quality, 1½ lb. fish oil, preferably herring oil, and 40 gallons water. It is essential that the spray be correctly prepared, and attention should be given to the details which follow. Grind up the resin as finely as practicable and then either mix the resin and caustic soda while dry and add the mixture to 2 gallons of water, or dissolve the caustic soda in 2 gallons of water and add the resin slowly while the solution boils

gently. The latter method is generally used, and appears on the whole to be the more satisfactory. The solution expands appreciably when hot, and the container in which it is boiled should therefore be considerably larger in capacity than the volume of the water, otherwise boiling over may occur. The solution should be kept fairly well stirred whilst being boiled to prevent any solids from sticking to the bottom. A light brown or creamy scum appears on the cooling surface of the mixture, the boiling of which should be continued until a clear dark liquid can be detected beneath the scum. The fish oil is then added and the whole boiled for a few minutes to ensure that no free oil remains. The concentrate thus prepared is then ready for dilution with 38 gallons of cold water. The agitator should be kept running whilst the spray is in the vat. When the concentrate cools a good deal of solid is precipitated, and thus when large lots are prepared it is necessary to divide the stock solution while hot. This may be done by dividing up as soon as prepared, and as most spray vats in use in Queensland have a capacity of either 40 or 75 gallons, the stock solution will be most conveniently divided into lots of 2 or 3¾ gallons. If the concentrate is to be stored the fish oil should not be added before storage unless the mixture can be kept in perfectly airtight containers. If preferred, however, a concentrate can be prepared as described up to but not including the addition of the fish oil. This concentrate can be stored in bulk until required when it is reheated, the fish oil added and the mixture again boiled for a few minutes. This final concentrate can then be diluted to spray strength.

The results obtained against the bug will depend absolutely on the thoroughness of application. To effect a kill the bugs must be hit at the time of spraying, as the spray is purely a contact one and dries quickly. The best results will be obtained by spraying the outside of the tree first. Whenever the bugs are molested they immediately commence to crawl down the branches. Thus by spraying the outside first those bugs which are merely disturbed will crawl at once into positions in which they are more easily hit from the inside. This method of spraying is, of course, the reverse of what is usually recommended, and is only practicable on fairly large trees where the operator can stand well inside the tree and avoid the heaviest drip.

It may be pointed out that the great majority of bugs, even though dead, do not fall from the tree for some considerable time, and, therefore, it is not possible to obtain any idea of the amount of good done merely by inspecting the ground under the trees immediately after the spraying. A careful examination of the tree an hour later will, however, generally give a good indication of the "kill."

Though the spray is somewhat effective against all active stages of the pest, by far the best results are to be obtained against those in the second instar. As will be seen from the life history notes this stage is to be found from the early part of March at least until August. Spraying, therefore, should always be done during the period intervening between those months. It does not matter greatly just when the application is made within that period, but it is wise to do it as early in the year as is convenient, preferably late in March or early in April. If left too late it may hamper other work, and at the same time the maximum beneficial effects of the spray may not be secured. The spray, in addition to its effect on the bug, is a very efficient scalicide, and further has a marked cleansing effect on the skin of the fruit.

Though the spray is sticky it disappears quickly from the fruit, and there will be no necessity to wash off any residue if the fruit be left on the tree for three or four days after application.

The only ill-effect noted after extensive use of this spray mixture by orchardists has been when it was used in very hot weather or when the preparation of the spray was faulty. In regard to the former the weather is never very hot during the period recommended for application against the bug, and no ill-effects have been noted when the temperature did not exceed 90 degrees F. With respect to the preparation, this is simple enough, and the few mistakes made have been through the use of shortcut methods in futile attempts to save a little time.

QUEENSLAND SHOW DATES, 1935.

March.

Allora, 6 and 7.
Milmerran, 12.
Goombungee, 15.
Pittsworth, 20 and 21.
Warwick, 26 to 28.

April.

Toowoomba, 1 to 4.
Tara—Show 3, Campdraft 4.
Dalby, 10 and 11.
Crow's Nest, 10 and 11.
Oakey, 13.
Kingaroy, 11 and 12.
Chinchilla, 16 and 17.
Nanango, 16 and 17.
Miles, 24.
Sydney, 15 to 24 April.
Dirranbandi, 24 and 25.
Rosewood Campdraft, 27.
Taroom Campdraft, 29.

May.

Wallumbilla, 1 and 2.
Taroom, 1 and 2.
Beaudesert, 1 and 2; Campdraft, 3 and 4.
Wondai, 2 and 3.
Goondiwindi, 3 and 4.
Longreach, 6 to 9.
Murgon, 9 to 11.
Blackall, 13 to 15.
Mitchell, 15 and 16.
Mundubbera, 15 and 16.
Goomeri, 15 and 16.
Barcaldine, 21 and 22.
Ipswich, 21 to 24.
Gympie, 22 and 23.
Biggenden, 23 and 24.
Toogoolawah, 24 and 25.
Kalbar, 25.
Maryborough, 28 to 30.

June.

Marburg, 1 to 3.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Boonah, 12 and 13.
Esk, 14 and 15.
Warrilview, 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Gatton, 3 and 4.
Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Cairns, 23, 24, 25.
Atherton, 30 and 31.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.

September

Imbil, 6 and 7.
Tully, 13 and 14.
Innisfail, 20 and 21.
Rocklea, 21.
Kenilworth, 28th.

Diseases of the Banana.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

BUNCHY TOP.

BUNCHY top differs considerably from the usual conception of a plant disease. It is not caused by a fungus or bacterial parasite, but by an infectious agent or virus which is very much smaller than either of these. Although this virus cannot be seen by even a high-powered microscope, it is known to live and multiply in the sap of the diseased plant. In most virus diseases the affected plant has no definite lesion such as a spot or rot, but is usually stunted and abnormal in foliage or fruit development.

In the case of bunchy top the leaves formed after infection are short and narrow with the margin distinctly up-curved. They fail to bend over normally and retain a stiff erect habit which, combined with the fact that the leaf stalk is greatly reduced in length, gives the characteristic rosetted appearance to which the disease owes its name. The foliage on such plants is crisp and brittle when crushed. A bunch is rarely produced unless infection has taken place late in the life of the plant.

Effective control of bunchy top necessitates recognising the disease in its early stages. A plant should be regarded with suspicion if the youngest leaves exhibit a light green colour along the edge and have blades which dip back sharply from the midrib and curve in again conspicuously from the margin (Plate 110). A definite and unquestionable diagnosis can then be made by examining the base of the youngest leaf from the underside and with the light behind it. If the plant is infected there will be seen narrow dark-green lines, broken in a dot and dash manner or sometimes continuous, lying between and parallel to the clear veins which run out at right angles to the midrib (Plate 109). There is also often one or more wide dark-green streaks running down the outside of the leaf stalk near its junction with the pseudostem.

Bunchy top is spread in the plantation by the banana aphis when it sucks the virus-infected sap of a diseased plant and then leaves it and feeds on a healthy one. Aphids may travel considerable distances in the air, and this accounts for isolated outbreaks of bunchy top in plantations otherwise free from the disease.

In a single stool the virus from a diseased parent plant may travel in the sap stream down to the corm and thence out through the connecting tissue to the young suckers, which will in turn develop the disease, usually remaining in a stunted and rosetted condition. The possibility of sucker infection has an important bearing on the control measures discussed below.

Control.

There is no known method of destroying the virus in the plant without destroying the plant itself, and hence anything in the nature of a cure is impossible; nor is it commercially practical to destroy all aphids in a plantation and so limit the spread of the disease by this means. It, therefore, becomes necessary to concentrate on eliminating the source of supply of the virus by exclusion and destruction of diseased plants.

Firstly, care must be taken that all suckers used for planting are free from bunchy top infection. The agents of the Banana Industry Protection Board are in a position to advise growers where suitable planting material may be obtained. They should also be consulted regarding the current planting policy, as a planting permit may have to be refused if the spread of bunchy top or other disease or pest is involved.

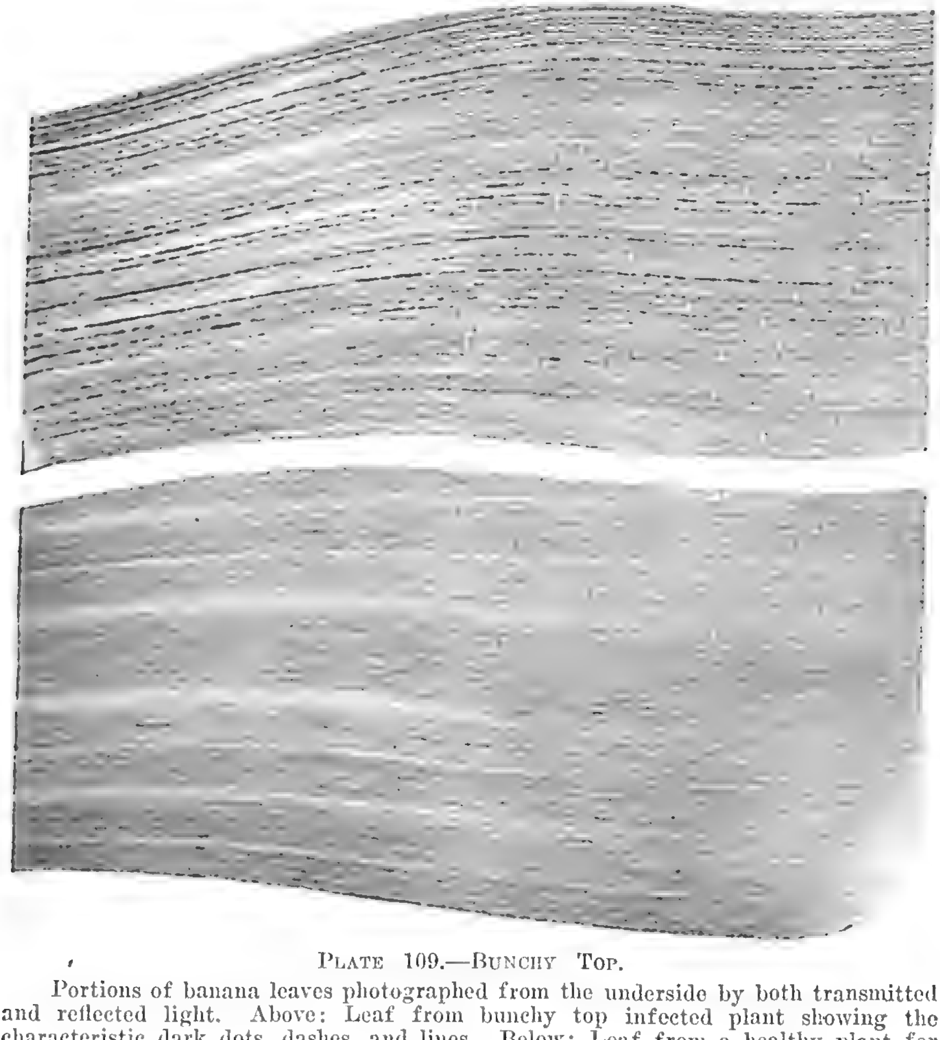


PLATE 109.—BUNCHY TOP.

Portions of banana leaves photographed from the underside by both transmitted and reflected light. Above: Leaf from bunchy top infected plant showing the characteristic dark dots, dashes, and lines. Below: Leaf from a healthy plant for comparison.

Secondly, diseased plants must be destroyed as soon as they show the first symptoms of infection. Thorough inspections should be made for the purpose of locating bunchy top plants. The frequency of these inspections will depend on the amount of bunchy top present, and must ensure that in every case the diseased plant is found as soon as the infection becomes recognisable. Eradication must follow immediately, and to be effective the following procedure should be followed:—

To prevent aphids leaving the diseased plant for a healthy one first pour not less than half a pint of pure kerosene into the central

leaf of the affected plant and other plants connected with it in the same stool. Wait for a few hours to allow the kerosene to trickle down round the leaf bases and so kill all aphids present. Then dig out the stool, including the infected plant and any others connected with it, and chop into small pieces to facilitate drying.

Heart Rot.

A second virus disease of bananas is now known to occur in this State. Although this disease is widely distributed throughout Southern Queensland it fortunately has not exhibited the capacity for rapid spread that has made bunchy top so serious. The characteristics of the disease vary at different times of the year. The most general symptom is a chlorotic condition of the younger leaves formed by light green to yellow streaks or bands which extend out from the midrib. These streaks may be narrow and interrupted so that a mosaic effect is produced (Plate 111). During the colder months a soft black rot may involve the funnel leaf and develop down into the heart of the plant. If this rot reaches the corm the whole plant may die. Often, however, with a change in environmental conditions the extension of the rot will cease, but the new leaves coming away may be narrow with irregular and blackened edges resulting from the previous rotting of their margin. As in the case of bunchy top the virus may pass from a diseased plant to the suckers with the production of a stunted and heavily mosaic-marked plant.

The cause of heart rot was first investigated by Magee in New South Wales. He showed that the disease was due to an infectious virus which was carried from infected to healthy plants by the banana aphis. Heart rot therefore resembles bunchy top in this respect. As would be expected, the control measures advocated in the case of the latter have so far effectively checked the spread of the former disease. Briefly, the recommendations are as follows:—

1. Plant only disease free suckers.

2. Kerosene and dig out an affected stool immediately heart rot symptoms are noticed.

Leaf Spot and Speckle.

Although leaf spot and speckle are probably distinct diseases they will be considered together here since they are usually both present in the plantation, and the final effect on the plant is very similar in each case.

Leaf spot is caused by the fungus *Cercospora musæ*. It is a disease which is widely distributed outside Queensland occurring as it does in India, the Eastern Tropics, and Fiji. The spots are easily recognised and are most prominent on the upper surface. They consist of narrow, oblong, or elliptical, brown to black, areas about half an inch long by an eighth in width. With age the centre dries out leaving a characteristic grey spot bordered with a black line and surrounded by a yellow halo. Usually the grey spots are still easily distinguishable after the leaf has dried out (Plate 112). Minute greyish tufts of fungus spores can sometimes be seen on the surface of the spots following prolonged rainy weather.

Speckle is found on the under surface of the leaf as scattered or aggregated dark brown to black blotches of varying size and intensity. These dark patches are formed in the first place by a close speckling

Plate 110.—Bunchy Top.

Two banana plants showing the symptoms of a fairly recent infection with bunchy top. In the younger leaves notice the dipping back of the blades from the midrib and the incurved and waved condition of the margin.

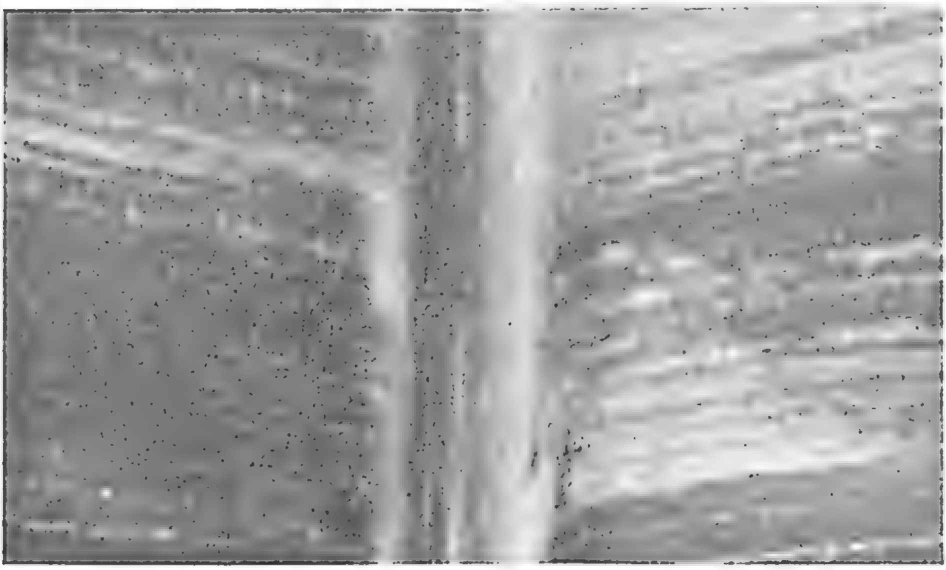


Plate 111.—Heart Rot.

Portion of a leaf showing the characteristic mosaic banding.

of the surface with greyish dots which later darken and coalesce (Plate 113). The cause of speckle is not as yet definitely known, although it is evidently of fungus origin. Its distribution is as wide as leaf spot.

Leaf spot is usually most abundant towards the outer end of the leaf, whilst speckle is, if anything, more prevalent towards the base. A shaded situation may definitely favour the development of the latter, but not the former. With both diseases the lower leaves are attacked first, and if the spots are numerous the individual lesions will coalesce and form large peninsulas of dead tissue extending from the margin in towards the midrib. Eventually the whole leaf will dry out. This results in a gradual defoliation of the plant from the base up and under average plantation conditions on growing plants an equilibrium is reached at which there are usually three leaves unaffected and four to five with leaf spot and speckle present in increasing intensity from above downwards. This is apparently sufficient leaf area to support the growth of the plant, and it is doubtful whether the initial size of the bunch when thrown is greatly affected by these leaf diseases. However, once the bunch is out no further leaves are formed, and the gradual invasion and consequent death of those present deprives the bunch of its normal shelter, with the result that the fruit often fails to develop properly and may become badly scalded.

Leaf spot and speckle are usually present at all times of the year, the relative importance of each varying somewhat with environmental conditions. Both diseases are favoured by wet weather, but in the case of leaf spot three or more days of continuous rain during the moderately warm weather of February, March, or April appears necessary for an epidemic outbreak. The leaf defoliation is most serious during the winter months when growth is at its slowest. In the Spring the situation changes and the plants tend to outgrow the disease. Conditions such as poor drainage, unsuitable soil and aspect, cold and heavy weevil borer infestation will add to the seriousness of leaf disease by retarding the growth of the plant, and even on their own account in the absence of disease may be responsible for abnormal leaf fall.

Control.

From the above discussion it will be seen that the maintenance of a continuous vigorous growth will help towards reducing loss from these diseases. In this connection it must be remembered that the banana is essentially a tropical plant and greatly affected by cool temperatures. The broad flexible leaves and other growth characters indicate that adequate shelter from strong winds and abundant and evenly distributed moisture are necessary. The roots are adapted to a loose well-drained soil adequately supplied with humus, and will suffer if exposed to extreme variations of wet and dry conditions. The provision of adequate windbreaks and the safeguarding of the better surface soil from erosion during the heavy summer rains by means of terracing, cover-cropping and other modifications of the usual cultural practice will greatly assist in maintaining the productiveness of a banana plantation in spite of the presence of disease.

Direct control of the leaf diseases by fungicides is made difficult by the nature of the banana plant itself and the inaccessibility of most plantations. Dusting has been proved to be ineffective, probably owing

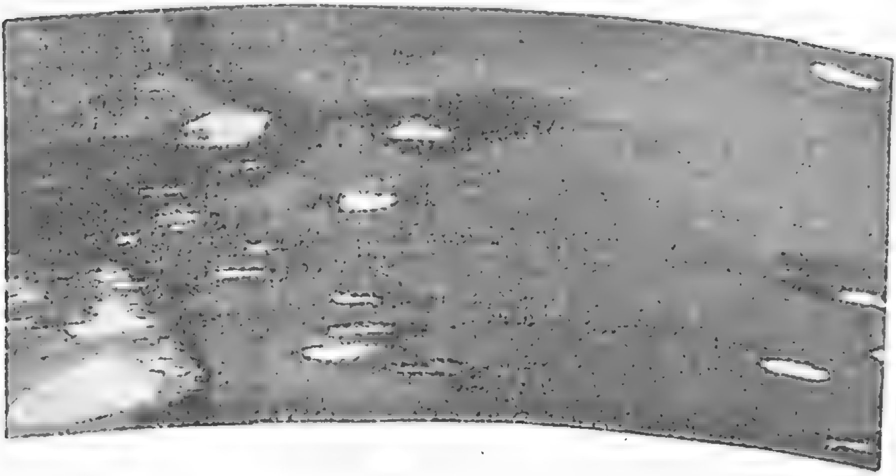


Plate 112.—Leaf Spot (*Cercospora musae*).

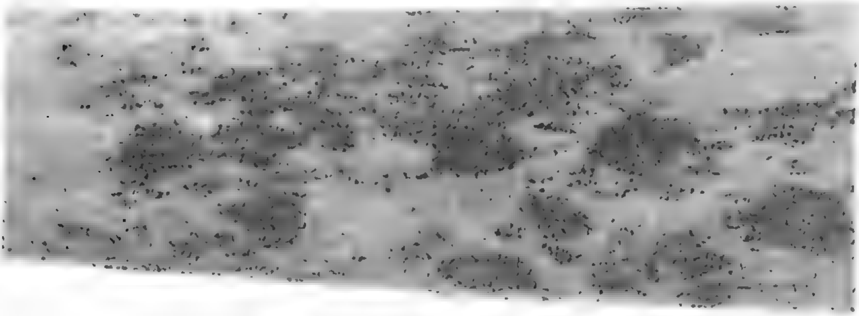


Plate 113.—Leaf Speckle.

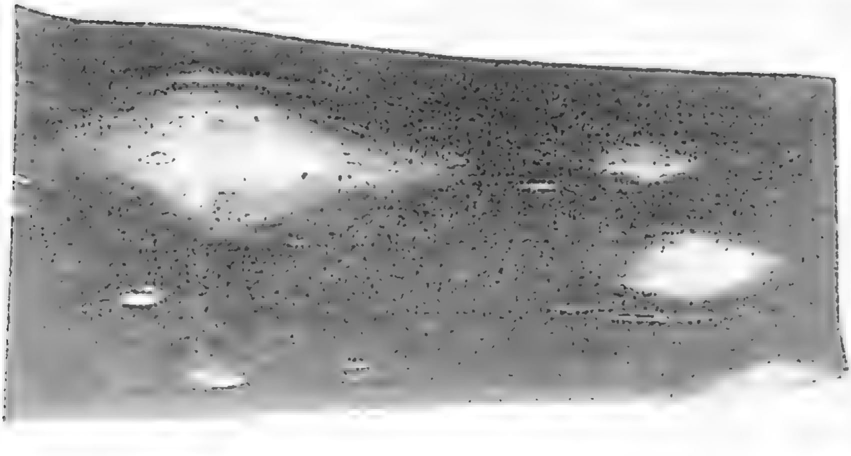


Plate 114.—Yellow Leaf Spot.

Four Cercospora spots are included in the specimen, and form a comparison as regards size. (Slightly reduced.)

to the difficulty of obtaining a permanent cover on the shiny leaf. Bordeaux mixture applied in February and March with a suitable spreader will check speckle and to a lesser extent leaf spot, but it is doubtful whether the final results obtained justify the trouble of spraying such a crop as the banana.

Perhaps the most practical method of reducing the loss due to leaf defoliation is to protect the developing bunch from exposure by covering it with bagging. Two methods are available. The bunch may be entirely enclosed in a hessian bag of suitable size. This procedure results in the greatest final benefit, but the slowness of the operation and the difficulty of determining the correct cutting maturity are decided disadvantages. In the second method half a corn sack is used. This is rapidly thrown over the exposed side of the bunch and secured behind with a nail. All bunches likely to be exposed should be covered as soon as the fruit commences to fill out, the correct time being largely a matter of experience. In order to provide for the heavy defoliation in winter and spring bagging should commence in April and continue throughout the winter so long as bunches are left without leaf protection.

Yellow Leaf Spot.

This leaf spot is serious only in the northern parts of the State, where it may cause leaf defoliation in a manner similar to Cercospora leaf spot. The disease commences on the lower leaves as indefinite light yellow areas. These take up an elliptic or more characteristically a definite diamond shape, turn deep yellow, and then gradually darken in the centre where they dry out to dark brown, leaving a narrow but distinct yellow margin (Plate 114). These spots, except in the very earliest stages, are considerably larger than those caused by *Cercospora musæ,* and may be as much as 3 to 4 inches long by 1 to 1½ inches broad. Young plantations may suffer badly from yellow leaf spot, whereas they are usually free from severe attacks of the other leaf diseases.

Yellow leaf spot is apparently caused by the fungus *Cordana musæ,* whose fructifications form a greyish down covering the under surface of the spots. This organism is widely distributed throughout tropical countries, but is not usually considered of as much importance as in Queensland, where severe defoliation has been known to result from its presence.

In plantations where yellow leaf spot is serious the protection of the fruit from scalding by the method described in the case of leaf spot and speckle should give some relief.

Panama Disease.

Panama disease affects only the tall-growing varieties, such as the Sugar, Lady's Finger, and Gros Michel. It is widely distributed throughout the world and has received its name from the region where it was first known to cause serious loss. The presence of the disease is indicated by the development of a deep yellow colour round the margin of the lower leaves, which later turn brown and dry out. The leaf stalk collapses, leaving the dead leaves in a gradually increasing number draped round the pseudostem.

A definite diagnosis of Panama is made by splitting up the base of the plant lengthwise, when the corm will be found discoloured by numerous brown to black lines running in all directions through the

white tissue. The brown vessels can usually be followed up through the sheathing leaf bases and out into the vertical partitions of the leaf stalk. The reddish brown lines in the latter situation are often a means of quickly identifying the disease.

Panama disease is caused by a fungus (*Fusarium cubense*) which is capable of living for some time in the soil and when a suitable opportunity offers may infect the banana plant by means of the roots or wounds in the corm. It then travels up the water conducting vessels causing the black lines already referred to. The fungus may grow out through the tissue connecting a diseased parent with the surrounding suckers, and the planting of such infected material is one of the chief means by which the disease is spread.

Control.

The only satisfactory way of dealing with Panama disease is by a combination of exclusion and eradication.

1. Only land which has not previously grown bananas or on which the disease has never occurred should be planted with susceptible varieties.

2. Obtain planting material only from a district in which Panama does not exist.

3. A plant may become infected by wind-borne spores, or by infectious material accidentally introduced on boots and farm implements. Immediately a plant shows signs of infection the whole stool should be dug out, chopped into pieces and burnt on the spot. Any instrument used in cutting a diseased plant should be washed in formalin solution or passed through a flame before using it on a healthy plant. It is unwise to replant in the same spot.

4. Unfavourable soil conditions, especially poor drainage, greatly increases the severity of Panama attack and, conversely, the provision of optimum conditions of growth for the fruit will help to diminish the loss from this disease.

Dry Rot.

Dry rot is not a disease of serious consequence, as only an isolated plant or a small group of plants is usually attacked. In an affected plant the leaves commence to die back from the margin and eventually the whole of the foliage becomes brown and dry. The pseudostem may be easily pushed over owing to the absence of sound roots. The normal corm tissue is largely replaced by a more or less dry, punky substance of a dirty white to brown colour. This consists of a mass of closely interwoven fungal threads which have invaded the corm and largely replaced the plant tissues.

Dry rot is caused by certain of the mushroom and bracket fungi, including a *Poria,* all of which live for the most part on dead and rotting stumps such as are present in abundance in the average banana plantation. From here it is possible for them to pass to a living banana plant should one be growing in close proximity and by invasion of the corm produce the dry rot described above.

In order to prevent the spread of dry rot to adjacent stools it is advisable to locate, if possible, the stump or roots from which infection has proceeded and remove and burn this material together with the infected corm.

Cigar End.

Cigar end is a trouble affecting relatively young fruit in the plantation. A firm dark decay commences at the apex of the fruit surrounding the dead floral parts. This rot extends back slowly for half an inch or so, causing the tissue to shrink and become more or less rounded in contrast to the angular nature of the immature fruit (Plate 116). There is a sharp line of demarcation between healthy and diseased tissue. Usually no further extension takes place, but the fruit ripens prematurely. The disease is caused by a fungus (*Stachylidium theobromæ*). The spores of this organism are produced in abundance on the surface of the blackened area, where they form an ashy grey or pinkish grey coat. In typical cases this gives to the shrunken end a striking resemblance to a burnt cigar tip, hence the name. The old shrivelled floral organs often persist for considerably longer than normally on affected fruit.

Although occasionally a large proportion of the fruit in a bunch is affected, it is more common for only a few fingers to show the disease; hence special control measures are not usually required. However, it is a wise precaution to open up the young bunch, where necessary, to the light and air and to remove the bracts which tend to remain attached to the developing hand, especially during wet weather. After a spell of dry weather when choke throat is in evidence, splitting the top of the pseudostem may be necessary to relieve the pressure on the outcoming bunch and so avoid injury to the tips of the fingers.

Black Finger.

While the bunch is still young and the fruit immature and angular one or more fingers may develop a jet black decay commencing at the tip and extending back towards the base until, unlike cigar end, the whole of the fruit is involved. The fruit becomes tapered by the gradual shrinkage of the affected region, which remains firm and eventually dries up to form a mummy (Plate 117). In the later stages numerous minute raised pustules constituting the fruiting bodies of the causal organism appear over the surface.

The cause of black finger has only recently been investigated. A fungus (*Phoma sp.*) has been isolated from affected fruit, and its pathogenicity proved by artificially inoculating healthy fruit on the plant and in the laboratory.

So far this disease has not appeared with sufficient frequency to call for special control measures, but the ventilating of the young bunch as for cigar end should help to prevent its occurrence.

Gumming.

Fruit which have developed gumming can be readily distinguished, as the bunch begins to fill out, by a tapered or pinched appearance of the flower end. One or more fruit so affected may be scattered through the bunch. On splitting the fruit lengthwise a reddish brown gummy condition of the tissues below the flower tip and extending along the centre will be apparent. Dark gummy specks of less intensity may form a more or less interrupted band along the outer margin of the pulp. Affected fruit does not ripen as soon as the normal, the tip in particular remaining green.

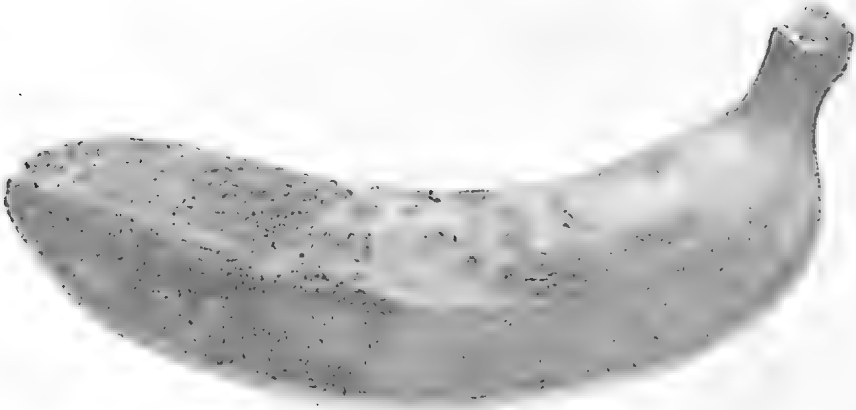


Plate 115.—Black Pit.

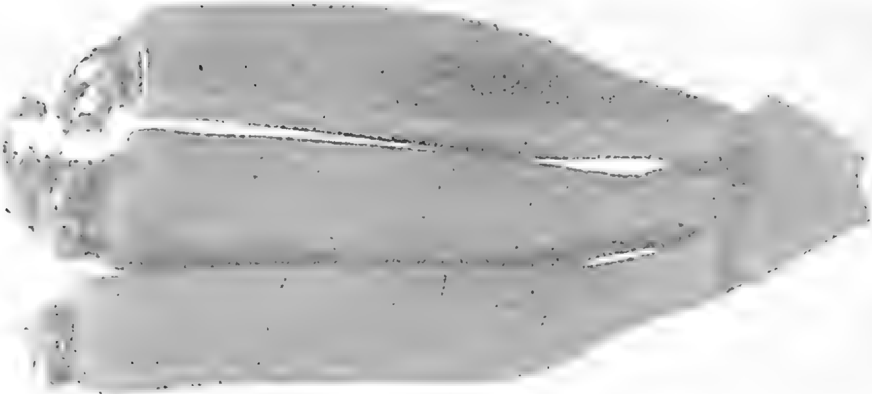


Plate 116.—Cigar End.

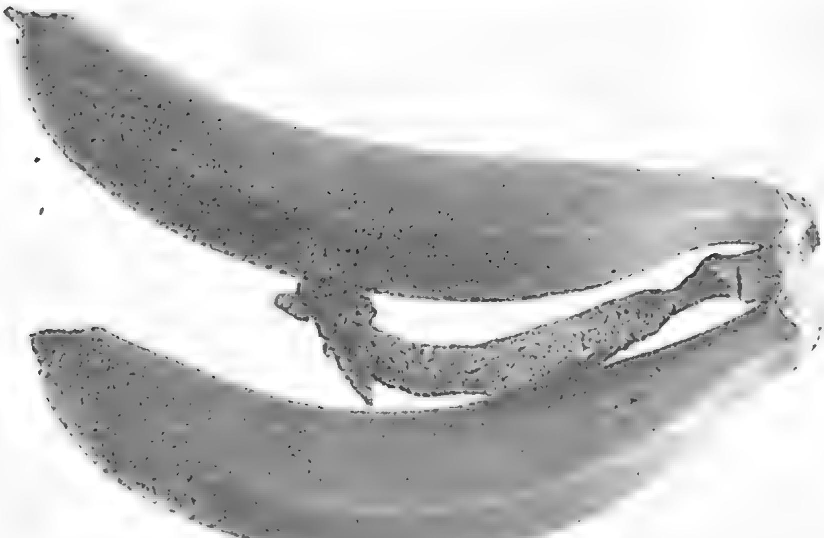


Plate 117.—Black Finger.

A disease occurring in the West Indies which closely resembles this one has been shown to be due to infection by a bacterium through the floral organs of the young fruit. As bacteria have in the past been isolated from Queensland specimens, it is possible that the same trouble exists in both countries.

So far it has not been necessary to take special precautions for the control of this disease, though the remarks already made regarding the opening up of the young bunch and the removal of bracts can be applied here also. All fruit having the characteristic pinched tip should, of course, be rejected when packing.

Black Pit.

Black pit has made its appearance on frequent occasions since it was first recorded in 1930. Commencing as small reddish spots, shallow black pits of $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter are formed in the skin of green fruit (Plate 115). The spotting is most abundant on the upper hands of the bunch and on mature fruit.

The lesions are restricted to the skin and do not usually act as centres for any further decay. However, when the pits are numerous the disfigurement is sufficiently serious to render the fruit unfit for market, and at times whole bunches have had to be discarded.

The cause of black pit is not definitely known, but it has been observed that bunches bagged in the manner advised in connection with leaf spot develop few or no spots. Accordingly this means of reducing loss is recommended in plantations subject to the disease.

Squirter.

Squirter is a disease rarely seen in Queensland, since it usually makes its appearance in cased bananas after arrival on the Southern markets.

A fruit typically affected with this disease has the pulp decomposed to a dark semi-fluid state so that a squeeze of the hand will expel it in a stream from the stalk end. At an earlier stage there will be found a dark area of rotting tissue lying along the centre of the fruit with or without an obvious connection with the finger stalk through which infection almost invariably occurs (Plate 118). External symptoms may take the form of a blackened stalk, but are often lacking altogether.

The disease is caused by a fungus (*Nigrospora sphærica*), which for the most part exists in a non-parasitic manner on leaf bases, the bunch spathe or other dead banana material in the plantation, and on discarded bunch stalks and rotting fruit in the dumps near the packing shed. The shiny black fungus spores produced in these situations are liberated into the air and contaminate the fruit either in the plantation or during packing operations. The fungus then gains entrance through the broken fruit stalk and travelling down the vascular fibres sets up the typical rot in the pulp of the fruit.

Squirter does not develop when the fruit is in the unsprung or in the fully ripe condition, but in the intermediate stages. About ten days are necessary for the complete rot to take place. The disease is seasonal in its occurrence and is met with only in the cooler months from May until late spring. Chilling may have some indirect bearing on squirter development, and the delayed ripening period in the winter months may also be a factor in its seasonal distribution.

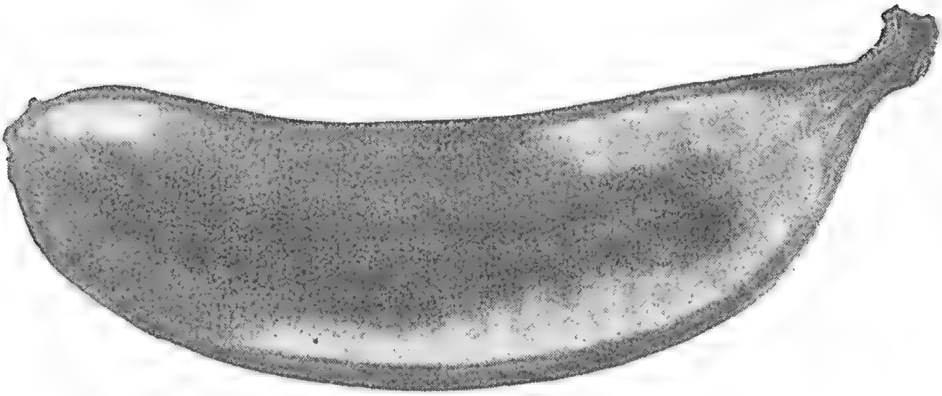


Plate 118.—Squirter.

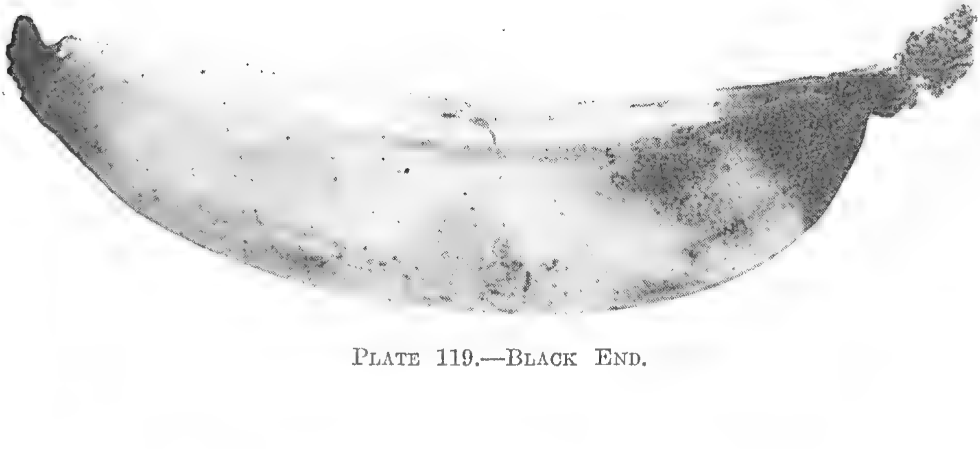


Plate 119.—Black End.

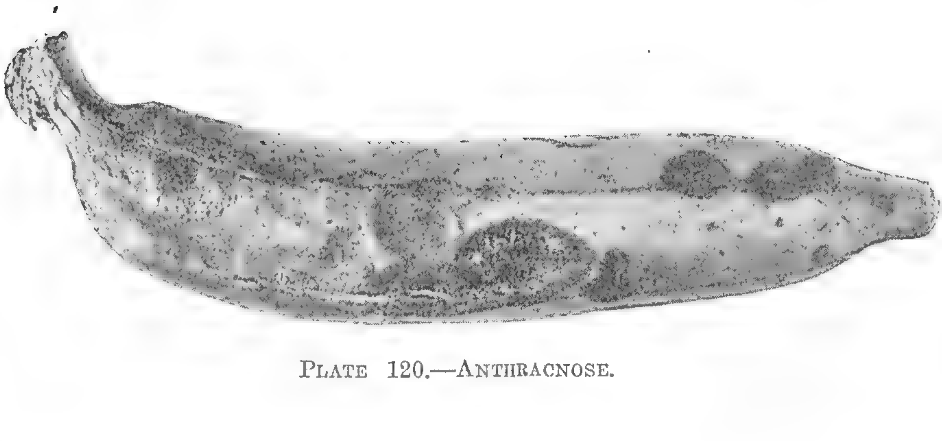


Plate 120.—Anthracnose.

Control.

1. Plantation and packing-shed hygiene will help to reduce the number of spores present. The bunch spathe and loose trash should be removed from the vicinity of the bunch. Rejected fruit and bunch stalks should be buried or burnt and the packing shed sprayed out occasionally with a 5 per cent. solution of formalin.

2. During the winter months squirter-liable fruit should be marketed without delay and ripened as quickly as possible by up-to-date methods so that the period during which the rot can take place is reduced to a minimum.

3. Packing in part hands instead of singles will often reduce the number of fruit infected.

4. Bagging bunches during the winter months, as has been advocated for leaf spot control, may help with squirter also, as it will lessen the amount of chilling likely to take place.

Fruit Stalk Rot or Black End.

This is purely a transport and market trouble. As the fruit ripens a soft, black, and usually wet rot commences at the broken end of the fruit stalk, or, in the case of bunch fruit, in wounds caused by bending the fruit at its point of attachment to the main stem. This results in a black shrivelled condition of the fruit stalk, from whence the rot may extend to the adjacent skin of the fruit and produce a soft watery condition of the pulp beneath (Plate 119).

Various wound parasites, more especially *Glœosporium musarum, Nigrospora sphœrica, Fusarium* spp., and *Stachylidium theobromœ* are associated with this type of decay. The development of *G. musarum* is favoured by high temperatures and most of the black end in summer is due to this organism. *N. sphœrica* is active during the winter and supplements the work of *Glœosporium* at this time. The species of *Fusarium* and *S. theobromœ* are of comparatively minor importance and are apparently unrestricted as regards their time of appearance. All these fungi occur abundantly on banana refuse in and around the packing shed and on dead leaf stalks, bunch tracts, and other parts of the plant in the field. Consequently, contamination with the spores of these organisms is easily accounted for. Bruises caused by rough handling and the surfaces exposed by breaking the bunch into fingers then serve as points of entry for the fungus, which develops further during transport.

Control.

1. Practise packing shed and plantation hygiene as recommended for squirter control. The plants should be kept reasonably free from dead leaves by periodic trashing.

2. Cut, pack, and rail fruit with the minimum of delay.

3. During periods when black end is prevalent the consignments should be ripened immediately they arrive at the market by up-to-date methods, keeping the humidity as low as practicable during the process, and the temperature at the correct point.

4. Pack in part hands rather than singles, avoiding undue tearing when splitting up the hands.

5. In the case of fruit sold and ripened in the bunch practically all loss may be eliminated by careful handling of the fruit so as to avoid bruising the fruit stalk.

Anthracnose.

Like black end, anthracnose is mainly a marketing trouble. Dark slightly sunken areas appear on the skin of the ripening fruit and enlarge rapidly (Plate 120). At first the skin only is affected, but later a soft water-soaked condition extends into the pulp and greatly hastens what is commonly known as the overripe condition. Under moist conditions the surface of the spots becomes covered with a pinkish mass of the spores of *Glœosporium musarum,* the fungus causing the disease.

Anthracnose is of most importance during a period of two to three months in midsummer. The skin of the fruit marketed at this time appears to be of a softer nature and more susceptible to attack, and the high temperatures prevailing favour the growth of the parasite. At this time black depressed areas may be formed on green fruit in the plantation, but this is of rare occurrence.

No definite means of control are known. The recommendations made in connection with black end are applicable here also. Careful handling at all stages to avoid bruising is important. As there is a tendency for fruit to ripen quickly during the summer months when anthracnose is prevalent the correct picking maturity must be studied in order to avoid the waste associated with fruit arriving in a mixed ripe condition. Fruit should not be allowed to stand in the hot sun either before or after packing.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Inland Pastures.

PART I.

Mitchell Grasses in the Warrego District.

By W. D. FRANCIS, Assistant Government Botanist.

PART II.

Response during 1934 Season of Mitchell and Other Grasses in Western and Central Queensland.

Compiled by S. L. EVERIST, Assistant to Botanist, from reports received.

[*A Report submitted to the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, on 14th April, 1934.*]

Foreword.

By C. T. WHITE, Government Botanist.

DURING the year 1933 considerable attention was given to statements from various sources that the Mitchell grasses of Western Queensland were diminishing, due to prolonged droughts and continued stocking. Therefore, when the drought broke towards the end of 1933, it was decided to try and obtain some definite information on the response of the Mitchell grasses following the good rains experienced over most of Western and Central Queensland. It was thought expedient, too, to obtain information on other grasses and herbage plants at the same time.

In March, 1934, Dr. E. Hirschfeld, who has taken considerable interest in Queensland grasses and carried out some experiments with them on his property in the Inglewood district, Western Darling Downs, wrote to the Hon. F. W. Bulcock suggesting that I should visit Western Queensland for the purpose of making a general survey of the pastures and their response following on the bounteous season of spring and summer 1933-34. Owing to Departmental work on hand it was not expedient for me to carry out this work, but it was decided that the Assistant Botanist, Mr. W. D. Francis, should visit the Charleville area for the purpose of obtaining information from station owners and others as to the regrowth made by Mitchell grasses. A careful study was made by Mr. Francis of Mitchell grasses in the field, and the report embodying his observations and recommendations is published herewith as the first part of the general report on the inland pastures. The possibility of going on with the experiments outlined by Mr. Francis will be considered in the near future.

On the 6th March, 1934, a circular letter was sent by the Department of Agriculture and Stock to all District Stock Inspectors and Stock Inspectors in the Western and Central districts. The assistance of the Land Administration Board was enlisted and the same circular was sent to Land Commissioners and Land Rangers in the Western and Central districts.

In the circular the following questions were asked:—

1. How have the Mitchell grasses in your district responded during the present season?
2. Is there more than one kind of Mitchell and more than one kind of Flinders Grass growing in your district? If so, could you let us have specimens with notes on the relative value of each?
3. Are there any other grasses of outstanding value growing in your district and valuable on account of either palatability or drought resistance?
4. Are there any herbs of outstanding merit associated with the grasses?
5. This Department has co-operated with many graziers in Central and Western Queensland by naming and reporting on any grasses and herbage plants submitted. We would be pleased to receive any specimens you care to send. In sending more than one specimen, number each and retain a duplicate similarly numbered. Of grasses a whole stalk doubled up so as to fold comfortably in a piece of newspaper should be sent, as well as several seed-heads. Of herbs, trees, &c., a shoot a few inches long bearing flowers or seed-heads should be forwarded.

The response to this circular was very gratifying and for months reports and specimens poured into the Department.

The specimens were determined as quickly as possible and the reports were filed until all had been received.

These reports have now been examined carefully and a summary of them is given below. The report is in two sections. The first deals with the reports from the various districts. In this portion will be found notes on the response of the Mitchell and Flinders grasses, and remarks made by various officers upon other grasses and herbage of the areas reported on by them. The second section consists of a list of the more important species of grasses and fodder plants forwarded with notes on the distribution and fodder value of each. In compiling this list information has been gathered from sources other than the reports furnished by officers of the Lands Department and the Department of Agriculture and Stock. These other sources of information are acknowledged separately.

From the reports submitted it appears that in some cases a diminution in the amount of Mitchell grass has taken place. Generally speaking, however, where the country is not overstocked and where sufficient rain fell, the Mitchell grasses are as good as ever they were. In those areas where a diminution in the amount of Mitchell grasses was reported overstocking has been indulged in for a long period of years, and this, coupled with prolonged dry periods, has resulted in the gradual disappearance of the Mitchell grasses. The depasturing of horses upon them seems to have a harmful effect upon the Mitchell grasses. The horses eat the seed-heads and paw up the tussocks, thus preventing the regeneration of the Mitchell grasses from seed or from the old roots.

Apart from the valuable notes received on the response of the Mitchell grasses, much information was received concerning the distribution and fodder value of some of the less widely known grasses and herbage plants. This information will be found set out in detail in the second part of the report.

The results obtained from the circular were certainly worth while, and the reports received have widened considerably our knowledge of the Queensland pastures.

That considerable interest is being taken in the management of the Western pastures is evident from the fact that some of the major pastoral companies have appointed pastoral research officers either to work on their own or in conjunction with the Council for Scientific and Industrial Research. The Walter and Eliza Hall Fellowship in Economic Biology was in March, 1934, awarded to Mr. S. T. Blake for the purpose of investigating the pastures of Western Queensland. These officers, particularly Mr. Blake, have worked in close co-operation with this Department. It is to be sincerely hoped that the outcome of this work will be that broad principles regarding the management of the Queensland pastures can be laid down.

PART I.

The Mitchell Grasses of the Warrego District of Western Queensland.

I. Introduction.

THIS report outlines the results of a visit to some of the Mitchell Grass areas of the Charleville district. The visit was made in co-operation with Mr. E. J. Tannock, the District Inspector of Stock. The area visited extends about 80 miles south and 70 miles north of Charleville. The purpose of the visit was to make some observations upon the grasses in the field and to ascertain the views of pastoralists and others upon the welfare of the principal grasses of the area.

The Mitchell grasses are confined to Australia. They are not limited to any one State. They are restricted to the inland parts of the continent, or at least they reach their greaest development there. In these inland areas the rainfall is comparatively low. The Mitchell grasses are seen at their best in the areas with an average annual rainfall of from 25 to 10 inches. Mostly, if not always, these grasses are found in the richest lands. They inhabit wide plains and extensive undulating downs composed of rich, deep, black, and brown soils. In

such areas they are often the dominant components of the grass lands. On account of the very extensive areas of Western Queensland which are covered by them and because of their durable and nutritive properties the Mitchell grasses must be recognised as one of the principal natural assets of Queensland.

II. The Kinds of Mitchell Grasses.

Four different kinds of Mitchell grasses are recognised by botanists. Our knowledge of the classification of the Mitchell grasses was considerably clarified by a paper published in 1928 in the Kew Bulletin by Mr. C. E. Hubbard, the distinguished specialist in grasses of the staff of the Royal Botanic Gardens, Kew, England.

The four different kinds are enumerated:—

1. *Mitchell Grass or Curly Mitchell Grass.*—This is by far the commonest of the Mitchell grasses, at least in the Charleville area. Apparently it is the most palatable of the group. The name Curly Mitchell grass owes its origin to the fact that the leaves, especially the older leaves, often bend downwards and inwards at the point and form

PLATE 121.

Curly Mitchell Grass (*Astrebla lappacea*) on Claverton, between Charleville and Cunnamulla. Forest vegetation on sky line. Mr. Tannock and Mr. McInnes in picture.

a circle or spiral. The leaves in the other kinds of Mitchell grasses often have the same tendency. This character therefore is not a reliable one upon which to distinguish this species. The botanical name of this species is *Astrebla lappacea*. (See Plates 121 and 123.)

2. *Barley Mitchell Grass.*—This species is distinguished from Curly Mitchell grass by its shorter and more compact seed-head, which is often enclosed at maturity on one side in a sheath. The seed-head of Barley Mitchell grass measures from 1½ to 5 inches long. This species is found in damper situations and in harder soils than Curly Mitchell grass. At times it grows on the margins of damp or low-lying places which are occupied by Bull Mitchell. It is often found in association with Bull and Hoop Mitchell. Its botanical name is *Astrebla pectinata*.

3. *Bull Mitchell or Wheat-eared Mitchell Grass.*—This is a coarse-growing grass with strong, prominent tall stems and a large, heavy, broad seed-head. It is commonly found in patches especially in damp and low-lying situations. It is generally regarded as much inferior to the two foregoing kinds. Its botanical name is *Astrebla squarrosa.* (See Plate 122.)

4. *Hoop Mitchell or Weeping Mitchell Grass.*—This kind is mostly readily recognised by its long, slender seed-heads often bent into a circle or semi-circle, from which it derives the name of Hoop Mitchell. The seed-heads are much more slender than those of the other kinds and vary from 5 to 14 inches in length. It is often found on harder and damper soils than those upon which Curly Mitchell grows. It is generally regarded as inferior to Curly Mitchell grass. Its botanical name is *Astrebla elymoides.*

PLATE 122.

Bull Mitchell Grass (*Astrebla squarrosa*) in a slight depression on plain at Claverton, between Charleville and Cunnamulla. The tussocks are evident. In the foreground seed-heads of the grass are seen.

The four kinds of Mitchell grasses are represented in the Charleville area. Sometimes the four kinds were found in the one paddock. The great bulk of the Mitchell grasses seen by Mr. Tannock and myself on the downs and plain country of the Charleville district consisted of Curly Mitchell. The other three kinds formed only a very small proportion of the Mitchell grasses seen in the area.

In one instance a considerable portion of a plain occupied by Barley Mitchell was pointed out to us as consisting originally of clay pan. It was explained to us that sheep first introduced the seed on to the clay pan and tramped it in. Later germination of the seed took place and the grass eventually spread and formed almost a pure stand of this species.

III. Characteristics of the Mitchell Grasses.

The Mitchell grasses are perennials. They commonly grow in tufts or tussocks (see Plates 121, 122, and 123). Although the following observations particularly apply to Curly Mitchell grass, they are also true to a certain extent of the other kinds.

The tufts or tussocks of Curly Mitchell grass vary considerably in size. When large they often exceed one foot across and sometimes consist of over 100 stems. In densely grassed country the tufts or tussocks of the grass are close to each other. In thinly and sparsely grassed areas the tussocks are generally distantly spread, say, from 6 feet between tussocks.

The stems are upright or nearly so at the base and arise from a hardened, creeping root-stock which is mostly situated beneath the surface of the soil. The stems are firm or even hard. The leaves are also firm in texture, and, so far as I have observed, they lack the succulence which is a feature of many valuable Australian grasses of a softer character such as Shot grass (*Paspalidium globoideum*), Dairy grass (*Eriochloa* sp.), &c. These two soft-textured grasses occur in the Charleville district and are referred to in a later part of this report.

PLATE 123.

Excavating and examining the roots of Curly Mitchell Grass (*Astrebla lappacea*) on black-soil downs at Oakwood, about 60 miles north of Charleville. The picture shows a pure stand of the grass. Messrs. Willis, Tannock, and White in picture.

The lack of succulence in mature Mitchell grasses probably contributes to their durability, which is one of their most conspicuous and valuable economic features.

The root-stock of the Mitchell grasses is of great importance when considering the persistence of these grasses through periods of drought and constant grazing by stock. The strongly perennial character of these grasses is due to the durable and life-retaining character of the root-stock. The life-retaining properties of the root-stock are due in some measure to the hardened character of its tissues and to the sheathing scales enveloping it. The root-stock branches freely and mostly measures $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter. The direction and extent of its growth determines the shape at ground level of the tufts of stems or tussocks. Large numbers of robust roots spring from the root-stock and pass downwards into the soil. By means of this strongly developed system of roots penetrating downwards for several feet into the soil, these grasses draw upon the last reserves of soil moisture and persist through dry weather and hardship.

The depth of soil penetration by the roots of the Curly Mitchell grass was studied on black-soil downs country north of Charleville (see Plate 123). It was found by digging that the roots terminated at a depth of 4 feet from the soil surface. At this depth the texture of the soil appeared to be still favourable for soil penetration. It did not appear that the soil texture formed any obstacle to further penetration by the roots. The roots for the first 2 feet were strong and hard and apparently of a texture similar to that of the root-stock. From 2 feet downwards the diminution in size and hardness was noticeable. The very small roots found from the 2-feet level down to 4 feet were often flattened in shape and easily broken.

For the determination of the depth of root penetration an especially large tussock of the grass was chosen. The large size of the tussock is an indication of considerable age.

I have heard and, I think, read statements to the effect that Mitchell grass penetrates the soil to a depth of 20 feet. So far I have not met anyone who has personally observed such a great depth of soil penetration by this grass.

IV. Mitchell and Flinders Grasses Compared.

In several of their characteristics the Mitchell grasses are strongly contrasted with the Flinders grasses. The common kind of Flinders grass in the area covered by Mr. Tannock and myself in the Charleville district is *Iseilema membranacea* (*Iseilema actinostachys*). The annual character of this grass is strongly emphasised. Its roots are mostly only a few inches long and rarely appear to attain as much as 1 foot in length. It is readily pulled up. If often seeds when very small. One plant in full seed only measured 2⅝ inches in length, including seed-heads and leaves. It is a fragile plant which readily breaks up and is blown about or falls on the ground. The dismembered and broken parts of Flinders grass when blown into hollows and when lying on the ground are reported to provide much forage which is appreciated by stock. With the advent of rain, however, it soon decays and is lost to stock at least for a season. In texture it is much softer than the Mitchell grasses and is often reputed to be more palatable. As a matter of fact, many graziers state that their stock eat many other grasses and many herbs in preference to the Mitchell grasses. However, the durable and perennial character of the Mitchell grasses, combined with their nutritive properties, gives them pride of place far above all other forage plants in the wide areas in which they are dominant.

Many graziers report an increase of Flinders grass in their localities during the present season. Mr. Tannock and I saw pure stands of this grass in some places, but pastures composed almost solely of it were not common.

V. Mitchell Grasses and their Resistance to Drought and Stock.

There can be no doubt that the Mitchell grasses, through their peculiar structure, texture, and other intrinsic properties, are extraordinarily resistant to drought and continued stocking. When considering this resistance attention is directed to the behaviour of the root-stock. The root-stock's life-retaining capacity is an exceedingly important factor in the survival of the grass.

During periods of drought in areas which have been heavily stocked the stubble of the Mitchell grass tussocks is often visible. Frequently it is bleached or at times it becomes darkened. We were often told that stock in dry seasons paw the ground to unearth the root-stocks, which they eat.

The question as to whether Mitchell grasses are diminishing was discussed with many pastoralists, drovers, and stockmen. Opinions on this subject are conflicting. Those who maintain that there is no thinning out of the Mitchell grasses state that they are just as prevalent now as they were in the past. Some of the men who discussed the matter with Mr. Tannock and myself stated that late summer rains are required for the growth of Mitchell grasses, that early rains, say, in the spring, bring up large quantities of herbage and these prevent the Mitchell grasses coming through later on in the season if rain falls. One grazier stated that he had observed that the root-stock of Mitchell grasses responded to both early and late summer rains, and that the seed germinated only with late summer rains. In some cases it was stated that Mitchell grasses had increased on some properties. A large proportion of those who contend that the grasses are not decreasing were connected with properties which had been lightly stocked or at least not overstocked. Those of the opposite opinion state that there is a noticeable diminution in the Mitchell grasses in areas which have been heavily stocked over a long period of years.

There were at least four experienced men who stated that horses are very severe on the Mitchell grasses. According to thir observations, horses are especially fond of the seed-heads, and when the grasses are in seed they regularly eat off the seed-heads. On this account, we were told, the horse paddocks of pastoral properties are often to be distinguished from other paddocks by the scarcity or shortness of the Mitchell grasses.

VI. The Past and Present Condition of the Ward Plain.

The part of the Ward Plain with which we are particularly concerned is about 10-12 miles in a north-westerly direction from Charleville. The stock route traversing the plain is from 1 to 2 miles wide in this locality.

From the fact that it is close to Charleville and is open to travelling stock, the stock-route portion of the plain has been very closely grazed over for a long period of years. The dominant plants on it to-day are salt weeds and small burr plants such as *Threlkeldia proceriflora, Bassia echinopsila, Bassia anisacanthoides,* and *Atriplex Muelleri.* At the time of our visit (March) there was a small amount of Flinders grass (*Iseilema membranacea*) and Curly Mitchell grass (*Astrebla lappacea*). All of these plants are native species (see Plate 124).

In the course of inquiries Mr. Tannock and I were able to ascertain from an authentic source that Mitchell grasses were very plentiful on this area thirty to forty years ago. This information was corroborated by a statement from an independent source. We were informed that about forty years ago the Mitchell grasses were so thick that they were readily mown down with a scythe, and the cut grass was taken in a cart to Charleville and sold.

Since that time the Ward Plain has undergone a great change. The Mitchell grasses are certainly far from common there now. In many parts of the plain these grasses are now absent or very rare.

We were informed that Mitchell grasses have not been plentiful on the Ward Plain for twenty years.

The stock-route portion of the Ward Plain is probably an extreme example of severe over-stocking over an extended period.

PLATE 124.

The stock route on the Ward Plain, about 12 miles north-west of Charleville. The vegetation shown in the foreground consists of low-growing Salt Weed (*Threlkeldia procoriflora*) and two low-growing burr-bearing plants (*Bassia echinopsila* and *B. anisacanthoides*). Mr. Tannock in picture.

VII. Are the Mitchell Grasses Diminishing?

From the examples of the destructive effects of horses which were shown to us and from the present condition of the stock route on the Ward Plain, it appears to us that Mitchell grasses are destroyed by continuous overstocking over an extended period of years, including drought years. In view of this conclusion we are of the opinion that at least some of the reports as to the diminution of Mitchell grasses in heavily overstocked areas are correct. With continuous overstocking and the incidence of droughts the root-stocks of the Mitchell grasses tend to die out. The dead root-stocks when dug up crumble rapidly to a powder in the fingers.

As suggested by some of the pastoralists, it is very desirable where possible to allow the Mitchell grasses to seed freely. We were informed that this practice is carried out by some pastoralists. The desirability of not overstocking is too obvious to need any special mention. It must, too, be recognised that there may be many cases where economic conditions will not allow of the execution of desirable precautions aimed at the maintenance and spread of the Mitchell grasses.

From the information we collected and from reports sent to the Government Botanist it is evident that the diminution in the Mitchell grasses is not confined to any one State or to any particular district. On the other hand, it should not be inferred from these remarks that the diminution is general. Many of the holdings seen by Mr. Tannock and myself were heavily grassed, and there were no reasons to believe that damage of any kind had been done to the grasses.

Apart from the statement that Mitchell grasses germinate with summer and late summer rains, we were not able to ascertain much information about the germination of the seed. We were informed that young seedlings resulting from germination brought on by one fall of rain were sometimes destroyed by hot, dry weather. In another quarter we were informed that the young seedlings are often pulled out by grazing stock.

VIII. The Rainfall and its Effect.

At least two men connected with stations claimed that there has been a decided shortage in the rainfall during the past few years. According to these men this shortage of rain, as well as overstocking, has contributed to the diminution of Mitchell grasses in some areas. One of these men, when asked how he arrived at the conclusion as to a shortage of rain, replied that considerably larger quantities of water had to be supplied to stock in recent years than in earlier years. He was further of the opinion that on account of the shrinkage in rainfall the soil-moisture level had retreated downwards, and in many cases the Mitchell grass roots had been unable to attain this moisture level and the grass died in consequence.

We heard indirectly that the statement has been made by some of the very early residents that the rainfall was much heavier in the very early days of settlement, because sheep thrived without artificial supplies of water in areas in which this would be impossible now. This circumstance is mentioned because it may possibly be of some interest in view of the rainfall figures given below, especially those of the decade 1893-1884. In this decade the rainfall was considerably above the average.

In view of the above statements as to the alleged shortage of rainfall in recent years, a visit was paid to the Divisional Meteorological Bureau, Brisbane. There I interviewed Mr. Hartshorn, First Meteorological Assistant. In reply to my inquiries Mr. Hartshorn informed me that he was not aware of any decrease in western rainfalls, but kindly gave me access to the official records and much valuable assistance. With the records at hand the average rainfall was computed for each decade dating backwards into the past from the end of 1933. Thus the first decade begins with 31st December, 1933, and ends with the 1st January, 1924. The following table shows the results:—

Station.	General Average.	Average 1933-1924.	Average 1923-1914.	Average 1913-1904.	Average 1903-1894.	Average 1893-1884.
Charleville ..	19·59	17·62	19·28	20·87	17·05	23·32
Cunnamulla	14·24	12·80	13·80	13·35	11·23	18·12
Tambo ..	21·44	19·61	21·0	23·12	17·66	Incomplete
Eulo	11·96	10·44	12·26	10·73	10·24	Incomplete
Hungerford	11·09	9·04	10·0	10·89	10·56	15·22
Morven ..	21·63	22·03	21·37	22·64	17·39	Incomplete

From the above table it is seen that there has been a considerable diminution in the rainfalls of Charleville, Cunnamulla, Eulo, Hungerford, and Tambo. Morven is exceptional, as there has been an increase over the general average during the decade just passed. Morven is nearer to the east than the other stations, and meteorological influences other than those at the other recording stations may operate there.

Considering the first decade dating back from 1933, the percentage diminution of rainfall from the general average has been 10 per cent. at Charleville and Cunnamulla, 12½ per cent. at Eulo, 18 per cent. at Hungerford, and 8½ per cent. at Tambo.

Bearing in mind that these percentages diminutions are spread over a period of ten years, it would appear that they represent a considerable shortage of rain. It is quite feasible, then, that this shortage has adversely affected the Mitchell grasses in common with other vegetation.

The rainfall averages for the decade 1903-1894 show a very dry period at all stations, and the figures in the table can be compared with those of the decade just passed (1933-1924).

Some interest also attaches to the figures for 1893-1884, where they are available. The figures here are encouragingly high. They are encouraging because they suggest that such seasons may recur. One naturally asks if this decade represented the seasons of plenitude in which old residents claim that artificially supplied water was not required in certain localities.

IX. Suggested Tests and Experiments.

It is very desirable to obtain accurate information on at least two points. The response of overstocked areas to the removal of stock from them for varying periods of time is one important point. Another subject which should amply repay investigation is the germinating properties of Mitchell grass seed. The seed of Curly Mitchell grass is referred to here. With accurate information concerning the germination of the seed, some productive and readily applied method of pasture treatment may be arrived at. The fact that much of the western areas during severe drought periods appears bare and after rain is transformed into wide expanses of luxuriant vegetation indicates that seeds play an exceptionally important part in carrying different species of plants through dry periods.

Possibly there are peculiarities in the germination of Mitchell grass seed which may be utilised in spreading the species. In any case it is as well to ascertain how long the seed is likely to last in the soil.

It is suggested that a quantity of Mitchell grass seed be obtained and stored in suitable receptacles at Charleville. The seed could be left in charge of Mr. E. J. Tannock, the District Inspector of Stock. A certain number of the seeds could be tested each year by the Pure Seeds Branch of the Department of Agriculture and Stock. In this way it could be ascertained if there are any peculiarities with respect to germination and age in the seeds.

The stock-route portion of the Ward Plain would provide a suitable area on which to study the effect of closing an area to stock. If it is practicable to keep stock off a small portion, say, 20 acres, of this area, the progress of the Mitchell grasses on it could be observed. We

discussed this matter with some of the pastoralists of Charleville. They unanimously agreed that it would be extremely interesting to carry such a plan into effect. The difficulty of keeping the area, when it is fenced, free of stock was emphasised. After the area has been shut up for some time the fresh feed in it will constitute a considerable temptation, and the fence may be cut to allow hungry stock into the fresh feed. However, this difficulty may not be insurmountable. If this Department, with the sanction of the Department of Public Lands, decides to make this trial, Mr. E. J. Tannock, District Inspector of Stock, in co-operation with the Warrego Shire Council, may be able to devise some means of keeping stock off the preserved area. If it is found impracticable to close off a portion of the stock route on the Ward Plain, perhaps some other closely eaten-over area could be treated. In that event it would be necessary to ensure that the chosen area had been Mitchell grass country.

Once a suitable area is secured against invasion by stock the progress of the grasses and other vegetation could be carefully studied. As soon as the area is shut off a botanical survey of it should be made. Chosen areas could be photographed with a large-sized camera in order to show the aspect and distribution of the various grasses and plants. This photographic work could be effectively carried out by the Government Photographer attached to the Department of Agriculture and Stock. The botanical surveys and photographic studies could be made at suitable intervals so that permanent records could be made of the changes brought about by the absence of stock. By such means as these considerable light may be thrown on the problem of regeneration of Mitchell grasses. It is quite possible, too, that some of the results accruing from the fenced-off area may be correlated with laboratory germination tests of the seed.

As already mentioned, two burr-bearing plants (*Bassia echinopsila* and *Bassia anisacanthoides*) are very common constituents of the vegetation of the Ward Plain. The fencing-off trial may possibly indicate some means of controlling the spread of these and allied plants, such as the Galvanised Burr (*Bassia Birchii*).

In view of the remarks under the section "Rainfall and its Effect," it is clear that data on the distribution of soil moisture may prove to be valuable. Especially is it desirable to obtain information concerning the moisture at various levels in the soil from the surface down to about 4 feet. The growth rate of the Mitchell grasses and other plants may be found to be correlated with certain percentage distributions of moisture at various soil depths. The Agricultural Chemist could be asked to furnish further details on this point. Naturally it would be most desirable that such moisture determinations should be carried out periodically on the fenced-off plot already referred to. If soil moisture determinations are to be made at the proposed observation plot, it would naturally be advantageous to have a rain gauge on the area and keep records of the rainfalls.

X. Some Grasses Associated with Mitchell Grasses.

Blue grass (*Dichanthium sericeum*) is common in some parts, especially to the north-east of Charleville. We were informed by the manager of a large station that Blue grass is brought on by early rains, say, November to January; that rains in March and April favour

Mitchell grasses; that when Blue grass is heavy there is less Mitchell; that when Blue grass is light there is a heavier growth of Mitchell; and that there was more Mitchell on his holding during the last three years than before.

It may be worth mentioning here that we were informed that some of the older residents of the country north of Charleville state that Blue grass once covered the country now occupied by the Mitchell grasses. We heard this of more than one area north of Charleville, but the statements in each case only reached us indirectly. If observations in the future indicate that there are more or less marked successions or cycles of vegetation in certain areas, these statements concerning the prevalence of Blue grass in the past may prove of interest. Blue grass has a good reputation, but does not appear to have the durable properties of the Mitchell grasses, as according to reports it appears to be more susceptible to disruption and decay.

PLATE 125.

Brown-top Grass (*Eulalia fulva*) on plain at Wallal, 12 miles south of Charleville. The dark streaks represent the brown seed-heads of the grass.

Brown Top was met with occasionally in Mitchell grass country. This grass is sometimes locally known as Brown-top Blue grass. It is referred to by botanists as *Eulalia fulva*. It was most commonly found on low-lying ground. Occasionally it was interspersed with Bull Mitchell. The leaves and stems are mostly greyish green or reddish in colour. That it is palatable in western areas is evident from the way it is eaten down by stock (see Plate 125).

A tall Rat's Tail grass (*Thellungia advena*) was often seen in the Mitchell grass country. This is a tough grass which grows in tussocks. The leaves at the base of the stem were often eaten off, indicating that it provides some feed for stock. Another grass with a scattered distribution in Mitchell grass country is Early Spring grass or Dairy grass (*Eriochloa* sp.). This is a fairly succulent grass with a high reputation for palatability. Shot grass (*Paspalidium globoideum*) was less frequent than the two preceding species. It was seen chiefly in damp

places and along bore drains. Its name is derived from the resemblance of its seed to shot. It is a succulent grass with a high reputation for palatability.

PLATE 126.

Mulga country, about 6 miles south of Charleville. The trees shown are Mulgas (*Acacia aneura*). The leaves and shoots of the Mulga are readily eaten by stock. This type of country is a very valuable standby in droughts.

Acknowledgments.

The writer is especially indebted to Mr. E. J. Tannock, District Inspector of Stock, for his very able co-operation in all the field work. Several questions were discussed with Mr. C. T. White, Government Botanist, and his assistance is gratefully acknowledged. To all of those who so kindly extended hospitality to us and to those who unreservedly placed their experience at our disposal cordial acknowledgment is expressed.

NOTE.—*Part II. of this article will appear in the April "Agricultural Journal."*

Mammitis.

By K. S. McINTOSH, B.V.Sc., H.D.A., Veterinary Officer (Animal Health Station).

MAMMITIS or, as it is sometimes called, mastitis, is a disease of the udder of cows and is well known to many dairy men throughout Australia, and practically all other countries in the world.

The annual economic loss caused by this disease by diminished milk production is difficult to estimate, but judging by its prevalence must be enormous.

To appreciate the explanation of the disease we must first consider the structure of the normal udder. The udder consists of two large milk secreting glands which lie side by side and are separated by a distinct wall or septum. Each of these glands is again divided into two separate portions, and thus the udder consists of four quarters.

If we examine a portion of the gland substance of the udder under the microscope, we find that it is composed of tiny chambers which empty by means of minute tubes. It is in these chambers that the milk is manufactured and then drained away by means of the minute tubes. The tubes pass downwards and are jointed by many others forming larger ones, which eventually empty into a milk cistern or reservoir, one of which is situated at the upper end of each teat.

From the milk cistern a wide milk duct or teat canal passes down the centre of each teat to its external opening. This opening is normally closed by a circular muscle, except, of course, during the process of milking when pressure is exerted by the hands to force the milk through. The udder is thus a complicated and delicate arrangement of glands and their corresponding milk tubes. The whole of these structures is supported by a delicate framework of connective tissue and supplied with nourishment by innumerable tiny blood vessels.

Mammitis simply means inflammation of the udder. Apart from wounds and bruises, there are several diseases which cause inflammation of the udder, including tuberculosis, actinomycosis, contagious mammitis, and acute non-specific mammitis.

In these notes the two usual forms—contagious mammitis and acute non-specific mammitis—will be dealt with.

Contagious Mammitis.

Contagious mammitis is a chronic inflammation of the udder caused by one of several special kinds of germ, the commonest being Streptococcus of mammitis.

Although this germ grows best in the udder of a cow, it also lives for long periods in dust, &c., particularly if it is not exposed to the action of disinfectants or sunlight. It is conveyed from one cow to another by the hands of milkers, by milking machines or by contaminated dust. Having gained entrance to the teat canal, the germ does not take long to invade the remainder of that quarter of the udder, establish itself by rapid multiplication and set up a chronic type of inflammation.

The first symptom of inflammation may be a pinkish tint in the milk, due to the presence of blood; or the milk may be reduced in

quantity and altered in appearance. Often there is a secretion of watery fluid containing small yellowish particles of pus. Later nothing but thick yellow pus can be milked from the affected part.

One or more quarters may become affected, and as the disease progresses the gland tissue is destroyed and replaced by an overgrowth of the fibrous tissue framework of the udder. The normal udder has a soft flabby feel when empty, but the udder affected with old-standing mammitis has a hard lumpy or knotty texture due to old abscesses and masses of fibrous tissue.

In time, perhaps, when the cow is dried off, the affected quarter or quarters partially or completely cease to function.

The disease is slow and insidious in its progress, often leading the farmer to believe that the cow is only suffering from a chill, the result being that it may be well established in the herd before the seriousness of the position is realised.

Prevention.

The main thing to bear in mind is that the disease is contagious, so, firstly, be extremely careful when purchasing a cow to avoid introducing the disease into the herd. Care should be taken to examine the udder and milk, and to obtain a reliable history regarding the health of the rest of the herd from which she comes.

A handy method of examining the milk is to strain it as it is drawn through a piece of black cloth. This will enable you to detect any small clots or pieces of pus.

Once the disease is discovered in the herd, isolate the affected cows by running them in a separate paddock and milk them after the balance of the herd is finished.

Do not milk pus, &c., on to the floor of the bails, as in this way the germs contaminate dust and spread the disease. All abnormal milk and pus should be stripped into a bucket or kerosene tin containing disinfectant and later disposed of by burying.

Wash the hands thoroughly and dry them on a clean towel after milking each cow. Wash the teats and udder of the cow before milking in a clean weak solution of Condy's crystals.

Treatment.

The next thing to consider is treatment. This consists of general, local, and inoculation.

By general treatment is meant keeping the cow in good general health by proper feeding and, if necessary, rugging her during cold weather; also give her a dose of 10 ounces of Epsom salts and 2 ounces of ginger. This will assist her to eliminate any poisons which she has absorbed from the diseased udder.

The local treatment consists of stripping the cow thoroughly at least three times per day; oftener if possible. During and after the stripping the udder should be massaged with some mild liniment such as soap liniment. The object of this is to press as much pus as possible from the gland substance and remove it by stripping. In other words, it is an attempt to drain the pus from the udder.

Vaccination.

Vaccination is the injection under the skin of the animal of an enormous number of dead germs of the same type as those which cause the disease.

As the germs are dead they cannot set up an attack of the disease, but they can and do stimulate the production of defensive substances in the tissues of the animal which if sufficiently strong will control the infection in the udder.

The ideal vaccine to use is one which is made from the animal or herd which is to be treated. To do this a clean bottle is boiled and corked to kill any germs which may already be in it. The affected teat is then carefully washed and dried and the first squirt of milk expressed. The sample taken should consist of the second, third, and last squirts of milk.

At the Animal Health Station, Yeerongpilly, numerous vaccines are made throughout the year for various stockowners, and the procedure is somewhat like this:—

A bottle of milk from a suspected cow is received and examined to determine what disease producing germs it contains. A small quantity is then sown on culture media on which the germs grow. Quite a number of colonies appear after twenty-four hours, but the ones which cause mammitis are recognised by their appearance.

These particular colonies are then carefully removed by means of a sterilised needle and grown in sterilised broth for forty-eight hours. After this time a small quantity of antiseptic is added which soon kills the germs.

This now constitutes the crude vaccine which is ready for use after it has been standardised and tested in various ways to make sure it will be effective but not harmful in any way to the animal.

Vaccine treatment strikes at the very root of the trouble, but it must not be regarded as a miracle which will obviate any necessity for the prevention and other general and local treatment which has already been dealt with. It is an extremely useful method of preventing animals from contracting the disease, and is also a curative in larger doses.

To obtain some record of its effectiveness in the field, farmers were asked to comment on their experience with its use. In practically all cases where the vaccine was used properly very favourable reports came to hand.

For many years vendors of proprietary medicines have been selling substances to inject into the udder to cure mammitis. We have already noted the extreme complexity and delicacy of the udder tissue, and from this it can easily be realised that it is practically impossible to reach the small milk manufacturing chambers high up in the udder with any antiseptic. In addition, most antiseptics which would kill the mammitis germs would also destroy the milk secreting glands of the udder. Thus the Department cannot as yet recommend any of these udder injections for the treatment of mammitis.

Non-specific Acute Mammitis.

This form of mammitis is not caused by any particular germ, but rather by invasion of the udder by numerous types.

It is commonly seen soon after calving, after the use of a dirty or non-sterilised milking tube, or after injury, exposure to cold and wet, &c.

First, the udder becomes inflamed, enlarged, hot, and painful. The flow of milk practically ceases, the cow goes off her feed.

Treatment should be adopted as soon as the case is noticed. Give the cow 1 lb. of Epsom salts and 2 ounces of ginger in a quart of water.

The udder should be bathed and stripped out every two hours and the cow kept in a dry comfortable stall or paddock. At each stripping when the inflammation and pain has subsided somewhat the udder should be massaged, but not vigorously enough to cause unnecessary pain. Any abscesses which form on the surface of the udder should be opened and flushed out with weak antiseptic.

With this form of mammitis, treatment must be thorough and energetic, otherwise the cow may lose one or more quarters or, perhaps, even die.

TANNING FUR SKINS.

"Lightning" Process and the Wattle Bark Method.

The "Agricultural Gazette" of New South Wales, in discussing recipes for tanning fur skins, says that the "lightning process" is much quicker than wattle-bark tanning but, while quite effective, is not as good as the latter method.

THE "LIGHTNING" PROCESS.—Cut off the useless parts of the skin and then soften it by soaking, so that all flesh and fat may be scraped from the inside with a blunt knife. Soak the skin next in warm water for an hour, and during that time mix equal quantities of borax, saltpetre, and Glauber salts with enough water to make a thin paste. About half an ounce of each ingredient will give enough for a small skin, and proportionately more will be required for larger ones. When the skin has soaked in the warm water, lift it and spread it out flat, so that the paste may be applied with a brush to the inside of the skin; more paste will be required where the skin is thick than where it is thin. Double the skin together, flesh side inwards, and place it in a cool place for twenty-four hours, at the end of which time it should be washed clean and treated in the same way as before with a mixture of 1 oz. sodium carbonate (washing soda), ½ oz. borax, and 2 oz. hard white soap; these must be melted together slowly without being allowed to boil. The skin should then be folded together again and put in a warm place for twenty-four hours. After this, dissolve 4 oz. alum, 8 oz. salt, and 2 oz. sodium bicarbonate (baking soda) in sufficient hot water to saturate the skin; the water used should be soft, preferably rain water. When this is cool enough not to scald the hands, the skin should be immersed and left for twelve hours; then wring it out and hang it up to dry. The soaking and drying must be repeated two or three times, till the skin is soft and pliable, after which it may be rubbed smooth with fine sandpaper and pumice-stone.

WATTLE-BARK TANNING.—The second method, in which wattle-bark is the tanning agent, though not so quickly accomplished, should give better results.

Collect some wattle-bark and make a strong decoction by boiling or steeping the bark in water. A bushel of crushed bark from a tannery, if one is near at hand, will be found an easy way of getting the best bark. The skin should be scraped clean on the inside, as in the "lightning" process, before steeping begins. It is best to let the skin lie as flat as possible while soaking; and a large, square, zinc-lined packing-case is therefore preferable to a barrel. The skins should be completely covered by the liquid, which must either be changed once a week or boiled anew and skimmed. While the skin is out of the liquid each week it should be lightly scraped. Large skins take up to six weeks to tan well, but small skins will not require more than a month.

Use and Care of Milking Machines.

IT frequently comes to the notice of the Department that milking machines are discarded by dairy farmers allegedly owing to the production of lower-grade cream. It is generally found, however, that lack of suitable attention on the part of the dairy farmer is the primary cause. As the milking machine is one of the greatest factors in dairying economics, the following instructions in regard to their use and care are re-issued.

With proper care and attention to cleanliness machines will deliver first-class produce.

Milking.

Keep the milking shed, yards, and surroundings in a clean, sanitary condition. Wash the cows' teats in clean water, and draw milk from each teat and ascertain if the milk is normal before putting on the teat cups. To place the teat cups in position bend them all down except the one you are going to attach to the teat; attach each cup in like manner. When the cups are all attached and the milking is proceeding satisfactorily, do not interfere with the machines until the cow is milked out. See that no air enters the cups and destroys the vacuum; this defect is indicated by a hissing sound caused by the air rushing into the cups.

Should a cup fall off the teats give it immediate attention, as the suction will draw dust and particles of dirt into the system and contaminate the milk.

The cleansing of the milking machines is one of the most important parts of the dairyman's operations. Failure to thoroughly wash and properly cleanse the plant after each milking will result in the production of low-grade milk, cream, and dairy products.

Cleansing the Machines.

After completion of milking do not delay in carrying out this important work, which will, if properly performed, materially assist in producing high-grade milk.

Turn off the air tap in each bail. Start at the end bail and clean adhering particles of dirt from the outside of the cups and claws so as to prevent the dirt entering the flushing water. Then thoroughly flush each unit in turn by drawing through it at least half a bucket of cold water, dipping the cups in and out of the water so as to draw in air during the flushing. A thorough flushing out with cold water will remove traces of milk from the rubber teat cups, pipes, releaser, &c. Always use cold water for this flushing. On no account should hot water be used, as it will tend to cause casein to become caked on the inside of the pipes. Scalding water at a temperature of at least 180 deg. Fahr., to which may be added one tablespoonful of washing soda to every 2 gallons, should then be drawn through the cups and pipes, care being taken to admit the water slowly at first in order to gradually heat the sight glass so as to prevent its breakage. Thoroughly clean the milk pipe line by means of the brush supplied with the machine, and according to instructions. The air pipes and vacuum tank, which frequently become foul owing to milk vapours entering and condensing in them, should be regularly cleansed and sterilised with boiling water. With

machines in which water can be drawn through the air pipes by means of the vacuum pump, care should be taken not to flood the vacuum pan, thereby causing the water to get into the pump. The sterilisation of dairy appliances and equipment is most effectively and economically done by boiling water, and where it can be utilised nothing is usually gained by the addition of chemical disinfectants. When the cleansing of the piping is completed, open all taps and leave the pump running for a few minutes to dry out the pipe line. This assists in keeping the plant in a sanitary condition. Leave all pipes open when the plant is not in use, so as to allow the air to circulate through the system. The releaser should be detached, thoroughly cleansed, and allowed to dry.

Cleansing the Teat Cups.

When the flushing out of the machine as described has been completed, remove the teat cups and rubber connections. Dissemble the cups, and carefully brush the cups and claws with a dairy scrubbing brush. This should be done in hot water in which soda or a cleansing powder has been dissolved. It is essential to remove all grease in the first flushing and to then brush and cleanse the rubbers. If the rubber inflations have not been thoroughly cleansed they will be sticky to the touch, which is an indication of a film of grease on the rubber. The surface of a well-cleansed rubber will cling when the finger is rubbed along it. Careless cleansing will allow the grease to penetrate the surface of the rubber to the extent that it cannot be scoured out, and the rubber will perish. Rubbers so affected should be discarded. Careless cleansing of the inside of the teat cup cases gives rise to corrosion and pitting of the surface. Where cups have screw caps the cleansing of the threads should receive attention, and a slight smear of vaseline applied to threaded parts will assist in keeping them in good order. The dissembling and cleansing of cups and claws should be done as frequently as possible and not less than three times a week.

Cups and rubbers, after being cleansed, may be either left in an antiseptic solution or may be dipped in same for fifteen to twenty minutes, then removed and placed in a suitable receptacle in a cool place, away from the light, and protected from flies and dust. The vessel in which the disinfecting solution is held must be large enough to allow of the teat cups and rubbers being immersed in the solution without doubling the rubber tubes in a manner to prevent the complete displacement of air by the disinfecting solution.

Several solutions for dipping or soaking the cups and rubbers are recommended by manufacturers of the different milking plants, and include chlorine compounds, lime water and permanganate of potash, and brine solutions.

Special attention is drawn to the necessity of removing all traces of the solution that may be used for the sterilisation of the cups, rubbers, pipes, &c., that come in contact with milk, before the machine is again used. This is done by flushing each unit with sufficient hot water to effectively remove any trace of the solution before commencing to milk.

Many dairymen object to very hot water for cleansing rubber, believing that the rubber is destroyed. The judicious use of hot water will do no harm to rubber, provided that all grease is removed from the rubber before the hot water is applied. Rubber, if kept in water for ten to twenty minutes at a temperature of 165 to 175 deg., will be

unharmed by the heat, and most bacteria which detrimentally affect milk will be destroyed. If the rubber is placed in water at a temperature of from 180 to 190 deg. Fahr. long enough only for the surface of the rubber to be heated to the same temperature, the same object will be attained without injury to the rubber.

Lime a Suitable Disinfectant.

An efficient disinfecting solution is made by adding 2 lb. of quicklime to 10 gallons of water. Stir well and allow the solution to settle. Pour off the clear liquid and immerse teat cups and rubbers in it for a period of fifteen to twenty minutes.

MEN OF THE TREES.

PRESERVING A HERITAGE.

In an age when man's hand is tireless in despoiling nature, it is no small comfort to find that there is still a minority who think as R. L. Stevenson always thought, that "trees are the most civil society." Progress, mingling brutality with idealism, has denuded many countries of their forests, and of all countries England would seem to have suffered most. Vast tracts of her beautiful landscape have been ravished and lie under grass, with only an occasional tree to remind us of forgotten woods and glades. Millions of trees have been destroyed needlessly—millions could be planted again as an asset both to beauty and national wealth. And that is where "The Men of the Trees" hope to assert their influence.

"The Men of the Trees" is the picturesque name given to a voluntary society in England founded ten years ago by Mr. Richard St. Barbe Baker. Its aim, tersely expressed, is to develop a tree sense in every citizen, and to encourage all to plant, protect, and love trees everywhere. "What concerns us as Men of the Trees," says that society, "is that our country is being deprived of a permanent economic asset and the heritage of beauty which is characteristically British. Moreover, the continued destruction of trees cannot be disregarded, in view of the drought in many districts, and this drought is liable to become more serious unless remedial measures in the form of extensive reafforestation are put forward."

CULTIVATE A "TREE SENSE."

Though the exact relation of trees to rainfall is not easy to define, and may be treated as a subject of controversy, the principle may safely be laid down that forest areas lead to greater condensation both in the case of sea winds and the case of mountain mists. There is no doubt whatever that the climate of many rural localities in Britain has been gravely affected by the cutting down of forests and the failure to replace them. That much is to be admitted. But, apart altogether from that aspect of the question, the Men of the Trees are striving above everything to instil into the hearts of English people a "tree sense," which, once cultivated, will inevitably express itself in the transformation of the countryside. The society feels that everyone who plants trees is contributing a service to the nation, and for this reason should be assisted by relief from taxation. Woodlands which, for example, have been properly cared for by the owner or tenant, for life, should be exempt from death duties (these duties having levied a dreadful toll upon British forestry). Hundreds of great estates, thickly wooded for centuries, have been stripped of their timber in recent years to meet the demands of an inexorable and unimaginative Exchequer.

The society is constantly urging the planting of hedgerow trees and encouraging the planting of trees on a community basis. It is also offering prizes to schools for the best school plantation and organising arbor days and ceremonial tree plantings in memory of persons worthy of special honour. In addition it arranges periodical meetings, excursions, tree photographic exhibitions and competitions, lantern lectures, and parties for junior members. Expert advice on silviculture is given to all who ask for it, and several publications, including a highly artistc illustrated tree calendar, are regularly issued. Indeed, nothing that will assist in the attainment of its objectives is willingly left undone. First and last, the Men of the Trees are bent upon fulfilling the truth of Francis Thompson's noble words: "Thou can'st not stir a flower without troubling of a star."—J.R.W.T. in the "Sydney Morning Herald."

By H. W. BALL, Assistant Experimentalist.*

WHEAT has become the most important food of mankind, owing to its suitability for bread making, the simple cultivation required, and the crop's ready adaptability to differences of soil and climate.

The various forms and varieties of wheat are cultivated extensively in all agricultural countries with the exception of the more tropical regions, and it is interesting to know that wheat is being sown and harvested in one country or another the whole year round.

For most satisfactory growth, a cool moist growing season is required, followed by a bright dry ripening period of from six to eight weeks. In such favoured climates—Northern Europe and New Zealand provide examples—farmers secure an average yield of over 30 bushels per acre.

Wheat is the most important crop grown in Australia, being produced chiefly on those intercoastal areas having a rainfall of from 10 to 25 inches per annum. In Queensland, owing to its wider range of climatic conditions, and the diversity of its agriculture, wheat has not attained to the importance, relatively, that it has in the Southern States and Western Australia. Nevertheless, over 3,000,000 bushels from up to 300,000 acres of cultivation are produced annually in this State, although this quantity is not equal to Queensland requirements and has to be supplemented by Southern supplies.

On account of increasing consumption and seasonal variations, considerably more attention will have to be devoted to wheat growing before our State requirements are assured. Sufficient land is available, in the recognised wheat region, adjacent to the present railway system, and with the encouragement of payable prices, no other incentive would be necessary.

Value of the Industry.

Wheat growing already provides employment for over 3,000 farmers and their dependents, and also considerable employment in the transport, milling, and baking industries. Our record crop was produced

* In a broadcast address from A.B.C. Radio Station 4QG (Brisbane) and 4RK (Rockhampton).

in 1930—over 5,000,000 bushels, an average of over 18 bushels per acre. The average for the last ten years is over 14 bushels, and it is surprising to note that this exceeds the average of any mainland State in spite of the more capricious nature of our rainfall, only one-third of which falls during the growing period of the crop.

This higher average can largely be accounted for by the richness of the Queensland soils, especially those of the Darling Downs. Our climate also favours the production of superior, hard milling wheats of high gluten content.

The chief wheatgrowing centres in Queensland are Pittsworth, Allora, Clifton, Warwick, and Toowoomba, while some 20,000 acres are cropped in the Maranoa and a small area in the Dawson Valley and Central districts.

The largest individual areas are probably in the Pittsworth and Cecil Plains section, where endless seas of wheat present a most pleasing picture, especially during harvest when tractor-drawn header harvesters roar through the fields gathering hundreds of bags daily.

PLATE 127.—A FIELD OF PUSA WHEAT, WILLOWBURN HOSPITAL, TOOWOOMBA.

The Economic Position.

In recent years the price of wheat has fallen considerably in all countries, but the cost of land, machinery, and general necessities has not fallen to the same extent. Farmers, therefore, have need to consider ways and means of reducing their costs, in order to keep their business profitable. Increasing the yield per acre is an excellent way to accomplish this. If the standard of farming in every district could be raised to that of the most successful farmers, a considerable increase in acreage yields could be obtained. A study of cultural methods, soils, varieties, and seasonal variation will, therefore, help towards

the purpose in view. The essential points to observe will be outlined briefly.

Points in Field Practice.

As soon as possible after harvest it is advisable to burn the stubble, thus destroying fungous spores and putting the land in better condition for the first ploughing. This should be done when the land is neither too wet nor too dry, and should be not more than 4 to 5 inches deep, varying with the nature of the soil. This practice of early ploughing after harvest, and keeping the land free from weeds until sowing time, some four to five months, is termed summer fallowing, and is designed to conserve moisture for the use of the succeeding crop.

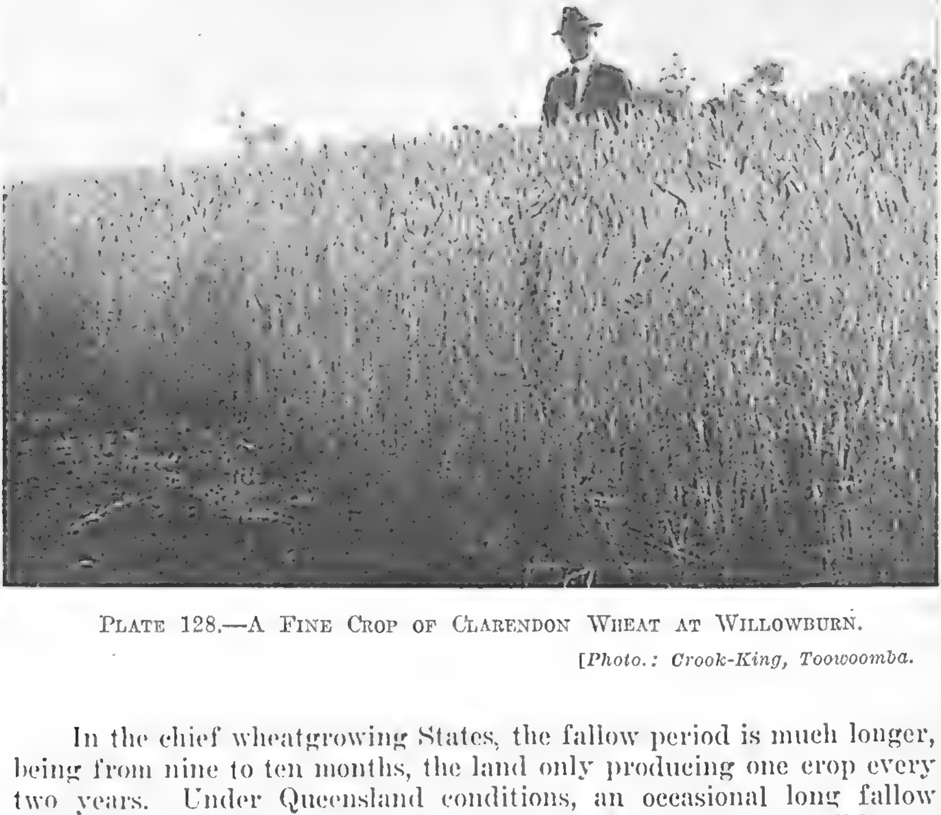


Plate 128.—A Fine Crop of Clarendon Wheat at Willowburn.

[*Photo.: Crook-King, Toowoomba.*

In the chief wheatgrowing States, the fallow period is much longer, being from nine to ten months, the land only producing one crop every two years. Under Queensland conditions, an occasional long fallow will be found useful in checking the spread of pests, such as wild oats. In some of the older settled districts long fallows, and the growing of fodder crops which can be grazed or cut before weed seeds mature are now becoming imperative, owing to the rapid spread of various weed pests. Sheep can be of great assistance in keeping the fallows clean, saving a considerable amount of cultivation, besides making good use of the weed growth.

Disc sundercut ploughs have become popular owing to their low cost of operation, but it is known that mould board ploughs will do better work on soil that is likely to break up too fine, and are also superior on land covered with weeds or rubbish.

Subsequent cultivation is best done with spring tooth or rigid tine cultivators and harrows, the object being to check weed growth, maintain a good mulch and bring about a desirable consolidation of the seed-bed prior to sowing.

On certain free working soils a method known as ploughless tillage is being tried, whereby rigid tined cultivators are used in place of the plough or disc cultivator. Excellent results are being obtained, combined with greater speed and reduced cost of working. The seeding is generally done with a cultivator drill or combine, this implement being excellent for sowing on a surface that has set after rain, and also where slight weed growth is present.

PLATE 129.—A FIELD OF GLUYAS WHEAT AT WILLOWBURN.

[*Photo.: Crook-King, Toowoomba.*

When to Sow Wheat.

The time to sow varies with the season, and may extend from May to July. Some farmers commence sowing the slower maturing varieties such as Currawa and Cleveland in April, and subsequently feed off the early growth to sheep. Sowing on moisture is the ideal method, putting the grain not more than 2 inches deep. Where conditions are favourable it is advisable to hurry the seeding as much as possible before the moisture is lost, for rapid sowing after a favourable seasonal rain is one of the most important factors in securing a good yield, particularly in the drier areas. Should rains be delayed and the soil sufficiently dry, it is usual to go ahead with the drilling, leaving the seed to await favourable rains, but with this method there is always a risk of light showers malting the grain, necessitating resowing.

Varieties.

The farmer has a wide choice of varieties and must largely determine for himself those that best suit his particular soil and climate. It is better to grow two or three varieties, rather than concentrate on

one which may not suit all seasons. Generally speaking, the short season or early wheats are more suited to the hot inland districts such as the Maranoa; whereas where the growing period is longer, the slower maturing varieties are capable of producing a heavier yield. No variety may be said to be perfect or to suit all conditions, which justifies the continued efforts to produce more desirable types.

Rust is one of the chief problems in Queensland, where warm humid conditions as the crop approaches maturity will often induce a severe infestation. The attempt to evolve rust-resistant varieties has met with a measure of success in the production of "Three Seas" and "Seafoam," which are similar rust-resistant types. There are many other varieties in general cultivation, such as Florence, Clarendon, Pusa, and Flora, all of which have good characteristics, but which will doubtless be superseded in due course by improved types. To illustrate the effectiveness of the Agricultural Department's work in wheat improvement it may be mentioned that varieties bred by Mr. Soutter at the Roma Experiment Farm now constitute approximately 40 per cent. of the entire Queensland crop.

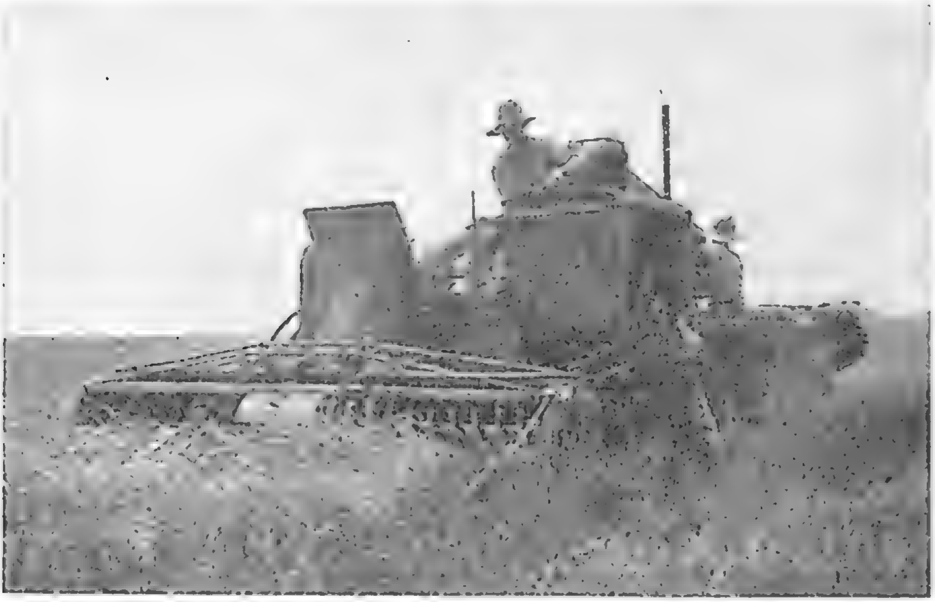


PLATE 130.—AN AUTO-HEADER HEAD ON.
Mechanised Agriculture has attained a high standard in Queensland.

The rate of seeding varies from 30 to 60 lb. per acre, depending on the district, the time of sowing, the character of the grain, the variety, and whether sown for hay or grain production.

Harvesting.

Header-harvesters are now in general use for harvesting, and in successfully gathering many storm lain crops they have saved the growers many thousands of pounds.

However, there is every incentive to speed up harvesting operations whenever suitably fine weather prevails. The early summer storms often coincide with the harvest period; and although the grain may

be gathered, there is some loss of grade by bleaching and weathering. Wheat farming machinery is expensive, and it is desirable to ascertain the most economical unit necessary to handle a certain area. It is obviously better business to work a plant to full capacity, although, owing to the speed usually necessary at seeding and harvesting times, there is a limit to the area which can be adequately worked by one set of implements. It is here that the tractor owner has a distinct advantage.

PLATE 131.—HARVESTING WHEAT IN QUEENSLAND—WHERE "TIME IS THE ESSENCE OF THE CONTRACT."

Wheatgrowing as a Business.

Considerable capital is required to commence a modern wheat farm when the cost of the land, improvements, machinery, sheep and living expenses for twelve months have to be provided for. However, reasonable terms can often be obtained on the purchase of land and machinery, while assistance is also given by the Agricultural Bank on the security of land and improvements. Also share farming can be undertaken by an experienced man with small capital.

Experimental work of assistance to the progressive wheat farmer would include accurate yield tests in the chief districts, rate of seeding tests, rotational trials, various methods of ploughing, cultivating, and rolling, the testing of long and short fallow periods, fertilizer tests on light or impoverished soils, determination of the costs of production with modern methods in the chief areas, also continued work in the breeding and selection of improved types.

As wheat is only one of many important crops raised in Queensland, we cannot hope to finance such extensive wheat research work as is carried out in the Southern States, where wheat is the major crop, but nevertheless the Department of Agriculture in Queensland has been of considerable service to the growers in the matter of breeding and introducing improved varieties.

The Queensland wheat industry has not progressed as rapidly as that of the Southern States and Western Australia, owing to land in the wheat belt being also admirably suited to general farming, dairying and sheep raising. This is obviously not to be deplored, for our farmers can alter their cropping system to meet changing economic conditions. The absence of any necessity to use fertilizer except on certain lighter

soils is also a distinct advantage, although this is offset to a certain extent by the heavier working of the Downs soils.

PLATE 132.—GRAIN READY FOR GRISTING.
In the Wake of an Auto-Header on a Darling Downs Farm.

Finally, the Queensland wheatgrower has had the benefit of organised marketing in recent years, which has greatly assisted in stabilising the industry, for despite any criticism of the Wheat Board's activities, the growers themselves remain in control through their elected representatives, and can therefore direct the ultimate policy to be pursued.

SHIFTING FARM MACHINERY.

When it has to be done along metalled roads, wear and tear and shaking loose of bolts may be avoided if the travelling wheels are covered with old motor tyres. Cut the bead off before wrapping round the wheels, draw the edges together and fasten with fine wire, puncturing the holes with a bradawl. If the tyre is too large, cut a piece out and join neatly. A stripper working on stony ground will do smoother work shod in this way.

Fruitgrowing in North Queensland.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) has received the following report on fruitgrowing in North Queensland from the Director of Fruit Culture (Mr. H. Barnes):—

THE usual fine weather period has been experienced during the last quarter of 1934. Growing conditions during the early part of the quarter were excellent, warm weather being well interspersed with showers. December, however, was excessively hot and dry, and orchards suffered in consequence.

Rainfall at Cairns during the period was 126 points during October, 512 during November, and 145 during December, the number of wet days being respectively 6, 14, and 6, a total fall for the quarter of 783 points as against 2,409 for the same period of 1933.

Districts included in this report are Daintree, Mossman, Port Douglas, Bartle Frere, Innisfail, Silkwood, Cardwell, Herberton, Ravenshoe, Kuranda, and Cairns.

The various fruit crops throughout the North appear to have been affected by the adverse climatic conditions of the earlier part of the year. Crops of practically all varieties of fruits are somewhat patchy even on orchards in the same localities.

Tropical and Sub-tropical Fruits.

Citrus throughout the North is showing a fairly light crop, except in a very few orchards where medium to good crops are showing. The blossoming was very light and very protracted, resulting in the crops on individual trees showing a wide range of growth, odd fruits being near maturity while the remainder vary right down to young fruit little more than just formed. As a general rule the trees have made good growth during the period, this being particularly the case with young trees.

Bananas showed considerable improvement in the condition of plants during the quarter. The fruit, however, has not shown a corresponding improvement.

Fresh plantings have been made in various parts of the district to supply local demand.

Sugar bananas, whilst frequently producing heavy bunches of good fruit, are practically all affected with Panama disease.

Pineapples.—Harvesting of this crop, which commenced in the Cairns district in late October, was practically concluded by the end of the year. In districts south of Cairns the season is slightly later, and harvesting was still in progress at the end of the quarter. The fruit produced in Cairns was chiefly of small size, and the introduction of fresh vigorous stock appears desirable.

The variety grown is almost exclusively Common Rough, this being most favoured in the local trade. The inclusion of small areas of Smooth Leaf variety would be well worth consideration of Cairns growers to extend the season.

Papaws have been in fair supply and chiefly of fair quality. The demand has been good.

Mangoes carried a very fair crop in the Cairns district, this being occasioned by dry weather during the blossoming period. The crop in the Cardwell district, on the other hand, was light, rain falling there while the trees were blossoming.

Throughout the North the general quality of mangoes grown is not good, the bulk of the trees being ordinary seedling types. Only a few good varieties are to be found. Although top-working or budding of mango trees is not quite so easy as the working over of citrus trees, it will be necessary to so treat the many poor type trees if any market demand is to be established for this fruit. Districts such as Cardwell and Rollingstone are well adapted to mango-growing, and a few trees of selected varieties only would be a good commercial proposition to local landholders.

Deciduous Fruits and Grapes.

The plum crop on the Tablelands was this season a light one. The chief variety grown is a small early-ripening one known locally as "Precious," but bearing a close resemblance to "Wright's Early." Other varieties grown are "Satsuma," "Kelsey," "Blood," and odd "Shiro" and Wickson."

The quality of fruit produced is good, but unfortunately considerable loss is caused by fruit fly.

Plum trees, and, in fact, most deciduous varieties of fruits grown on the Tablelands, are raised from cuttings, which strike with remarkable ease and produce good trees.

Pears of "Keiffers" and "China" varieties are cropping fairly well.

The grape crop is only fair this season. "Goethe," "Isabella," and "Ferdinand de Lessop" varieties are showing the most promising results.

Persimmons are again carrying a good crop this year. The Tableland conditions appear to be well suited to the growth of this fruit.

Nuts.

Queensland nuts were very severely tested by the hot dry conditions of the latter part of the quarter. In very many cases along the coastal area the leaves were badly scorched and some trees were completely killed. Protection of young trees from the direct rays of the sun appears to be almost imperative with this nut.

Litchis.—The growing of these trees is slowly expanding. Unfortunately, young trees are not obtainable locally, but have to be imported from China, and this retards the expansion of their cultivation.

Tung Oil.—Fresh plantings have been made in various parts of the North, the area now under these trees being approximately 80 acres. The crop during the year was rather lighter than that obtained in the previous season.

Other Fruits and Vegetables.

The watermelon crop during the quarter was a good one, melons of very fine quality being produced during the early part of the season. The later-ripened fruit, however, was rather deficient in flavour. One grower in the Tully area reports having cleared £180 from a melon crop this season.

Small patches of strawberries on both the coast and the Tablelands have produced well.

Tomatoes gave promise of good returns, but a week of wet weather during the early part of the quarter caused an invasion of blight and black spot, which curtailed the crop. The Kennedy district (the largest tomato-producing area north of Townsville) shipped only about 4,000 cases on this account.

Beans and cabbages were produced in fair quantities on the Tablelands during the quarter and found a ready sale. Bean fly is, however, a serious pest.

FARMYARD MANURE—ESTIMATED VALUE TO THE FARMER.

Although there is no standard composition for dung, most farmers agree that the value of the heap depends largely on the amount of urine absorbed in it. Out of 100 parts nitrogen fed to a fattening bullock, 4 parts are retained in the system: 96 are excreted, and of these only 22 are in the solid excreta, while 74 parts are in the urine.

In all stages of its history dung has been susceptible to loss, the loss falling most heavily on its constituents of highest manurial value. The two main sources of loss are volatilisation and liquid drainage from the byre or manure heap. Nitrogen in the urine in the form of urea being readily turned into carbonate of ammonia, this change means escape through the atmosphere, a circumstances which can be readily detected in stables. The better the dung is consolidated the less is the loss through volatilisation. Exposure of the dung heap to rain and drainage from the roofs of buildings are other sources of wastage of nitrogen and potash, and likewise, when the dung heap is not compressed, the process of combustion—although such manure gave a false increase in phosphoric acid—is another source of loss. Covered courts and covered feeding yards are the most perfect methods of keeping dung. By such methods the valuable constituents are far better preserved than in open heaps with the manure thrown on in haphazard manner, and where it lies exposed to air, rain, and frequently the water from the roofs of buildings.

As a comparison between the two systems, experiments have shown that under the latter half the nitrogen and half the potash can be lost, while any gain in phosphoric acid is more lost through shrinkage in weight. As regards the non-volatile constituents, the highest percentages are found in dung of uniform quality. There is no greater variation in these as regards the quality of straw consumed by stock, but dung in process of rotting tends to become poorer in non-volatile constituents. The difference between rich and poor dung, however, lies in the retaining or allowing to escape the volatile soluble materials.

In an effort to estimate the cash value of farmyard manure, Professor Hendrick, of the Aberdeen and North Scotland Agricultural College, points out that comparison of the excreta and urine of different farm animals shows how much more valuable urine is in nitrogen and potash, whereas phosphoric acid is almost entirely retained in the dung. The small percentage of nitrogen present is insoluble or slow acting, resembling the nitrogen in horn, shoddy, or wool, whereas nitrogen in urine is quite as valuable as nitrogen in sulphate of ammonia. Therefore, a higher value must be placed upon it, and similarly on the potash contained in the urine. Again, the influence of the food on the quantity and quality of dung and urine has to be taken into account. If an animal gets more water than is required, the excess is excreted in the form of diluted urine. Experiments have proved that a 9 cwt. bullock getting 119 lb. turnips and 9½ lb. straw daily, excreted 58 lb. urine containing .22 per cent. nitrogen, as contrasted with 15¼ lb. urine containing .58 per cent. nitrogen when the animals received half that quantity of turnips, 13 lb. straw, and 3 lb. linseed cake. Turnips fed in large quantities tend to increase the urine and reduce its quality. In regard to solids excreted, by far the larger percentage comes from the amount of straw consumed, experiments showing that from 6 lb. to 8 lb. straw supplied as much as 30 lb. or 40 lb. fœces, as excreted by a dairy cow.

Professor Hendrick estimated that 1 ton of good average quality dung is worth 8s. to 9s. per ton, while dung of inferior quality may be valued at 5s. to 6s. per ton.

Farm Horse Breeding.

From a paper read by Mr. M. F. O'Brien, of Kyancutta, at a conference of the Eyre's Peninsula Branch of the Agricultural Bureau of South Australia.

At the present time well-bred horses are bringing good prices, due, no doubt, to the curtailment of breeding a few years ago when tractors were taking the place of horses on so many farms. A large number of farmers who were previously using tractors have now turned their attention to breeding horses, as breeding is the most economical way of obtaining a really good team. Most farmers are breeding one or two foals each year to replace aged horses on their farms, while others are breeding more than they require, and these surplus horses will be placed on the market during the next few years, with the result that prices will not be maintained at their present level. It will therefore be necessary for those who are breeding horses for sale to pay special attention to the type of horse that they are breeding. A good type of farm horse will always command a fair price, while inferior and medium types will be hard to dispose of.

After selecting the best mares on the farm, be very careful in the choice of a sire. Do not breed from a horse not true to type. Many farmers breed from any sort of a colt because they can turn him in the paddock with the mares and save the trouble of looking after an entire. This method is false economy, for it costs no more to rear a good type of foal than a half-breed. It may be said that the half-breed will work as well as a good horse, but he will never look as well in the team, and it should be every farmer's desire to have as good a team as possible. Again, the medium horse will never command near the price that a good type horse will in the sale ring.

The farmer who does not keep an entire, and who patronises a travelling horse should, if he has a choice, look well into the merits of each horse travelling in his district. If you have a thick-set, nuggety mare always choose a good, tall horse, and vice versa, but remember he must be true to type, and a proved foal-getter. I prefer the Clydesdale type of horse for farm work. They usually prove to be good workers, combining strength with pace, and are exceptionally good tempered, while the mares are always good mothers.

When the foal is born catch it and paint the navel with iodine, repeating the treatment daily for three or four days or until the navel has dried up; this will often prevent navel ill. Also, see that the mare is normal and has plenty of milk. Give her a hot bran mash after foaling, continue to give liberal quantities of bran and crushed oats if she does not appear to have sufficient milk for the foal, and allow her to graze at will in a small paddock of greenfeed. Should the foal refuse or be unable to suckle it may be necessary to give an enema, but before doing so try working a little olive oil into the anus with a finger. This often gives relief to the foal and saves straining.

To wean a foal I prefer a small paddock of greenfeed. A small quantity of chaff and oats may be made available, the foal having free access to plenty of clean water. The mare must not be forgotten, and the day the foal is weaned the mother should be fed on chaff (no oats) containing 1 lb. of Epsom salts, and be given only small quantities of water for a day or two. It is best to keep the mare working as this will help to dry her off. Should the udder become swollen and hard rub first with olive oil, then with vinegar (three parts) and olive oil (one part), and if not working give plenty of exercise. Breed foals early, say, in July or August. At this time of the year there is usually plenty of greenfeed for the mares, and the foals when older will shed their coats earlier, and usually look better than a late foal. To breed early foals and wean them at, say, six months, it is essential that a small paddock of lucerne be available.

Colt foals should be castrated in spring at about 14 months. It is best to obtain the services of a veterinary surgeon, if one is available, but the operation may be successfully performed by any competent stockman. The three main points to remember are:—First, see that the emasculators have been sterilised; second, rope the colt securely and throw him on a patch of green grass—not in the stable or yard where there is any sign of stable manure; and third, use plenty of disinfectant.

The colt or filly can be broken in at two years by giving it a few short yokes in the cultivator or harrows when working back the fallow. This should harden the shoulders, and if worked during the harvest they will not be so likely to scald. Do not work a two-year-old more than four or five hours a day in a stripper or harvester if the weather is very hot.

It is advisable to put them in a wagon when wheat carting to teach them to pull, but do not overload, and do not expect a horse to do a full day's work or pull his full share of a load until he is at least three years old. If you treat a horse well while it is young you will be amply repaid by the extra service it will give when it is older.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled for the month of January, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Red Roan 4th of Blacklands	A. Pickels, Wondai	11,747·15	410·22	Premier of Hillview
Lady May 2nd of Merlin (269 days)	A. Pickels, Wondai	11,775·11	384·973	Limelight of Greyleigh
Charm III. of Bri Bri	A. E. Vohland, Aubigny	8,366·95	383·661	Gay Boy of Tryonne Villa
Duchess 2nd of Alvaglen	G. H. Knowles, Nanango	10,747·35	381·168	Cashier of Greyleigh
Eileen of Bellwood	S. J. Currant, Gunalda	8,720·05	370·982	Triumph of Oakvale
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Evelyn of Alfavale	W. H. Thompson, Nanango	15,239·8	660·362	Reward of Fairfield
Charm II. of Blacklands	A. M. Johnson, Gracemere	10,274·7	448·377	Red Prince of Blacklands
Glenore Gentle (269 days)	A. M. Johnson, Gracemere	9,330·45	376·291	Starlight of Sherwood
Blacklands Miss Minnie 2nd	A. M. Johnson, Gracemere	9,207·75	375·387	Red Prince of Blacklands
Rosenthal Pendant 5th	R. V. Littleton, Crow's Nest	8,643·7	346·472	Rosenthal Surplus
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Model 3rd of Alfavale (271 days)	W. H. Thompson, Nanango	10,964·47	501·438	Reward of Fairfield
Navillus Olive	C. O'Sullivan, East Greenmount	10,727·99	420·806	Midgets Sheik of Westbrook
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Navillus Violet	C. O'Sullivan, East Greenmount	7,925·75	322·864	Sunrise III. of Rosenthal
Rhodesview Daly 5th	W. Gierke and Sons, Helidon	7,923·86	298·357	Birdwood of Rhodesview

	Senior, 2 Years (over 2½ Years), Standard 270 Lb.			
Honey 8th of Sunnyside (365 days)	P. Moore, Wooroolin	10,415·35	414·776	Bruce of Avonë
Ashdale Duchess 4th (271 days)	A. Frank, Boonah	9,236·9	375·401	Diamond of Greyleigh
Foremost 5th of Blacklands (268 days)	A. Pickels, Wondai	7,183·15	324·438	Fussy's Monarch of Hillview
Home Hill Alice (269 days)	A. O. Althouse, Cloyna	7,810·44	298·528	Duchess Jellicoe of Fairfield
Rhodesview Tiny 6th	W. Gierke and Sons, Helidon	7,529·47	289·982	Colonel Rose of Rosenthal
Glenroy Jemima	W. F. Kajewski, Glencoe	7,893·77	287·465	Glenroy Kitchener
	Junior, 2 Years (under 2½ Years), Standard 230 Lb.			
Navillus Vision	C. O'Sullivan, East Greenmount	8,427·78	333·981	Midgets Sheik of Westbrook
Navillus Daisy II.	E. W. Jackson, Nobby	8,135·81	306·914	Midgets Sheik of Westbrook
Rhodesview Nancy 10th	W. Gierke and Sons, Helidon	5,899·62	262·878	Rhodesview Red Knight
Arley Speck 3rd	B. J. Nothling, Maleny	6,560·25	259·847	Greyleigh Syntax
Montcairn Charmaine	A. E. Vohland, Aubigny	5,888·45	243·513	Dandy of Wilga Vale
	FRIESIAN.			
	Mature Cow (over 5 Years), Standard 350 Lb.			
Ryfield Pansy 3rd (265 days)	P. Wason, Kingaroy	12,964·25	453·297	Bell De Koh Ongam (Imp.)
	Junior, 2 Years (under 2½ Years), Standard 230 Lb.			
Flagstone Pansy 2nd	P. Wason, Kingaroy	8,514·35	302·85	Mooroombin Colanthea
	JERSEY.			
	Mature Cow (over 5 Years), Standard 350 Lb.			
Trinity Skylight	F. P. Fowler and Sons, Biggenden	10,198·75	604·288	Lord Ettrey of Banyule
Lyndhurst Marella	J. B. Keys, Gowrie Little Plains	9,753·79	567·15	Mercedes Noble King of Ogilvie
Bellefaire Claire De Lune	J. B. Keys, Gowrie Little Plains	9,971·49	544·893	Masterpiece Yeribie of Bruce Vale
Fauvic Rejoice	H. Cochrane, Kin Kin	6,823·1	419·396	Yingara King
Kelvinside Alice Arabella	J. and R. Williams, Crawford	7,542·5	407·631	Benedictines Perfection of Kelvinside
Trecarne Rosette	T. A. Petherick, Lockyer	6,882·6	355·773	Carnation Royal Scot
	Junior, 3 Years (under 3½ Years), Standard 270 Lb.			
Blossom of Linwood	F. W. Kath, Ellesmere	7,453·85	373·51	Aerofoil of Banyule
College Peggy	Queensland Agricultural High School and College, Gatton	6,066·45	286·192	Burnside Renown

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
JERSEY—continued.				
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Glenview Sultan's Majesty	F. P. Fowler and Sons, Biggenden	7,579·05	397·567	Trinity Officer
Glenview Successor	F. P. Fowler and Sons, Biggenden	6,150·75	364·302	Trinity Officer
Glenview Miss Scott	F. P. Fowler and Sons, Biggenden	5,923·0	352·126	Trinity Officer
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Woodside Xenia	J. and R. Williams, Crawford	5,755·5	323·028	Rochettes Volunteer
Jesters Pet of Glenmore	J. and R. Williams, Crawford	5,062·95	273·136	Wheatlands Jester
Bellgarth Maderia 2nd	D. R. Hutton, Cunningham	4,536·06	253·802	Bellefaire's Blondes Bellringer
Glenmah Victors Duchess	F. A. Maher, Indooroopilly	5,543·9	244·503	Retfords Victors Noble
Heather of Wattleview	E. G. Groves, Kandanga	4,226·1	237·753	Prince Royal of Wattleview

Crown Land for Selection.

DAIRYING AND MIXED FARMING COUNTRY.

INNISFAIL DISTRICT.

On 3rd April next, thirty-two portion in the Clump Point district are to be made available for perpetual lease selection in areas ranging from 174 to 390 acres, and at capital values ranging from 16s. 8d. to £1 12s. 6d. per acre. Situated from 2 to 8 miles from El Arish Railway Station, which is 4 miles from Silkwood Butter Factory, the land comprises mostly tropical scrub with fair to good soils, interspersed with patches of forest. Permanently watered throughout.

On 2nd May next, fifty-three portions in the East Palmerston district are also to be made available in areas from 152 to 258 acres, and at capital values ranging from £1 10s. to £3 per acre. Situated from 16 to 22 miles from Innisfail, and from 1 to 7 miles from Nerada Railway Station. The nearest butter factory is at Silkwood, which is only 16 miles by rail from Innisfail. All dense tropical scrub with rich volcanic soil, permanently watered by numerous creeks and watercourses.

Applicants for these lands will be required to show that they have dairy farm experience and capital. Approved applicants wishing to inspect will be granted half-fare concession tickets on Queensland railways. Inspection fares paid by successful applicants will be refunded after selection.

Applications will be received at Land Office, Innisfail, and Lands Department, Brisbane, up to 3rd April for Clump Point lands, and 2nd May for East Palmerston lands.

Plans and particulars obtainable at Lands Department, Brisbane; Land Office, Innisfail; and Tourist Bureaux, Brisbane, Sydney, and Melbourne.

GRAZING HOMESTEAD SELECTION.

HUGHENDEN DISTRICT.

109,620 Acres of Sheep Land.

Parts of Maxwelton, Cambridge Downs, and Richmond Downs Resumptions.

The undermentioned lands will be open for Grazing Homestead Selection at the Court House, Richmond, on the 11th April, 1935:—

Portions 6 and 9, parish of Anstey, comprising the southern part of Maxwelton holding, situated about 20 miles south of Maxwelton Railway Station, areas 26,304 acres and 26,967 acres. Annual rents, 2¼d. per acre and 2d. per acre respectively for the first seven years.

Portion 8, parish of Kenmac, comprising the eastern part of Cambridge Downs holding, situated about 12 miles north of Richmond, area 23,409 acres. Annual rent, 2¾d. per acre for the first seven years.

Portion 1, parish of Doncaster, comprising the north-western part of Richmond Downs holding, situated about 28 miles north-east of Richmond. Area, 32,940 acres. Annual rent, 1¾d. per acre for the first seven years.

The term of lease in each case is twenty-eight years.

The provisional valuation of the improvements on the portions ranges from £834 to £971.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years.

The whole of the portions comprise open undulating downs well grassed in normal seasons with Mitchell, Flinders, blue, and barley grasses. Each portion is watered by a bore and drains.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, and the Land Agents, Hughenden and Richmond, and the Government Intelligence and Tourist Bureaux, Sydney and Melbourne.

THE FIREBRAND.

The commonest mistake in putting on a firebrand is making it too deep. For horses it is best to rub the hair down smoothly with olive oil or castor oil—fat will do, though not so well. Then apply the brand as hot as possible, just sufficiently to feel it bite the skin. For cattle a little firmer pressure is desirable, but it is well to remember that the better bred the animal the less pressure required.

CARE OF THE SAW.

Saws are the hardest tools for the amateur to keep in good order. Leave two or three of the teeth nearest the handle of a new saw always untouched; they never come into actual use, and if left intact provide a certain guide as to how the other teeth should be kept.

WATERPROOFING BOOTS.

One pint linseed oil, ¼ pint oil of turpentine, ¼ lb. beeswax, ¼ lb. pitch. Melt ingredients by standing tin container in boiling water away from a fire, renewing hot water till all are blended. The vapour is inflammable. When dissolved pour the liquid into a tin to set. When required for use melt a small quantity and rub well into the soles of the shoes.

Or: Melt in a tin over a low flame 1 pint boiled linseed oil, ½ lb. mutton suet, 6 oz. clean beeswax, and 4 oz. resin. See that boots are dry and clean, and give a plentiful dressing; it must be put on warm with a soft brush. The leather will become quite pliant and resist all moisture.

Or: Rub a lump of wax on the boots or shoes till they become a grey colour, then heat a piece of old linen or soft calico in the oven and smooth over with the hot rag till the leather has absorbed the wax. Allow the shoes to cool, then give a good brushing and apply a good boot polish.

IDENTIFYING THE POISON BOTTLE.

A sure way to avoid mistaking a poison bottle for another is to push two ordinary pins crossways through the top part of the cork at right angles, with the points projecting. That identifies the bottle even in the dark.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Shell Flower. Bindweed.

J.L.E. (Woodhill, Beaudesert Line)—

1. The plant with the green, bell-shaped flower is the Shell Flower or Molucca Balm (*Molucella lævis*), a native of Western Europe commonly cultivated in gardens as a curiosity. On parts of the Darling Downs it has become quite naturalised, but nowhere, we should say, has established itself as a dangerous weed.
2. The plant with underground runners bore neither flowers nor seeds, but it is evidently the Bindweed (*Convolvulus arvensis*). This weed has become increasingly common on the Darling Downs during the last four or five years, but this is the first case we have had of its growing outside that district. It is quite common in some of the Southern States. It is one of the worst weed pests so far introduced owing to its habit of producing a large number of underground running roots. Any part of these roots which is cut by a fork or plough forms a new plant. If the patch is only a small one it is probably better not to disturb the ground but to cut the young shoots and green portions down as they appear. If this is done regularly for a time the underground parts will become exhausted. A weak arsenical solution poured into the patch could be tried, and with this type of plant we think it is better, generally speaking, to use a large quantity of weak solution than a small quantity of strong. If it is decided to fork the plants out, care should be taken that the underground roots are not carried about and dropped here and there. As with Nut Grass, in small patches where it can be applied a covering of dry waste salt at the rate of ½ to 1 lb. per square foot has been found to be effective. This method is only applicable in large fields where a patch of barren ground does not matter, because the salt would render the land barren for a season or two.

Red Clover.

J.M. (Brisbane)—

The specimens represent the Red Clover, *Trifolium pratense*, a perennial species that seems to have come into favour in Queensland during the past few years, as I have seen and heard of several good plants of it. Under Queensland conditions it would probably be a short-lived perennial, lasting two, or perhaps three years at the most, although grazing might prolong the life of the plant. So far as we have observed, it does not seem altogether suitable for pasture conditions here, but is preferable for growing in small areas, either by itself or mixed with winter grasses for periodical grazing off. When grazed by itself it is very apt to cause bloat, and for this reason the mixing of it with grasses is to be preferred.

A Species of Yam.

F.McD. (Toowoomba)—

It is sometimes difficult to name plants from single leaves only, especially without any reference to the habit of growth, but the one you sent is a species of *Dioscorea*, probably *D. bulbifera*, *Var. suavoir*, a species of yam known as the Otaheite Potato. It is grown in Queensland purely as an ornamental vine. It dies down in the winter months, but bulbs or bulbils are borne in the axils of the leaves, and young plants grow from these. The question is often asked whether these tubers are edible or not, and we asked a leading authority on yams about the question once, and he told us that it was very difficult to say whether they were or not. As a general rule, if they were cut and went brown quickly, it was a sign that they were unfit for human consumption, and if in doubt the safest way was to cook and taste discreetly.

Chalta Tree. Osage Orange.

S.E.S. (Cairns)—

1. *Dillenia indica,* the Chalta Tree. A small, very handsome tree, with large white flowers, followed by large globular fruits. It is a native of India, and in that country the fruits are said to be used in curries and chutneys. Though I have seen the tree in cultivation in different parts of Queensland, I have never known anybody here use the fruit.
2. *Maclura pomifera,* Osage Orange. A native of North America, and largely planted in the Middle-West of the United States for hedges. It is grown in some parts of Australia, but on the whole, so far as I have observed, prefers a rather drier and colder climate to that of the Atherton Tableland. The fruits, though perhaps attractive looking, are inedible, and the plant does not belong to the citrus family, but to the Moracae family.

Plants Identified.

F.C.C. (Pittsworth)—

1. *Hibiscus trionum,* the Bladder Ketmia. A very common weed in parts of the Darling Downs and Central Queensland. Very common in the pastures. Belongs to a family not known to possess any poisonous qualities. This is probably the gooseberry-like plant mentioned by you.
2. *Cucumis* sp., probably *Cucumis myriocarpus,* the Gooseberry Cucumber, or Paddy Melon. The juicy pulp of the fruit is poisonous, due to a resinous body—myriocarpin. Bicarbonate of soda is the recognised antidote for cucumis poisoning.
3. *Neptunia gracilis,* the Sensitive Plant. A very common pasture herb and good fodder, and not known to be poisonous or harmful in any way.
4. *Atriplex semibaccata,* Salt Weed or Creeping Salt Bush. Same remarks apply as to No. 3.
5. *Anagallis arvensis,* the Pimpernel. A poisonous weed very common in cultivated areas in Queensland. Rarely eaten by stock in sufficient quantity to cause trouble, but some years ago we received seeds of this plant which have been taken in great quantity from the stomach of a cow. There are two forms in Queensland—one with red and the other with blue flowers. The properties are the same.
6. *Euphorbia drummondii,* Caustic creeper. A very common weed in parts of Queensland, and generally regarded as poisonous. Experienced stockowners always give the chief symptom as a marked swelling of the head and neck. When pierced this swelling exudes an amber-coloured fluid, and the life of the animal may be saved. Travelling stock seem to be most affected by the weed.
7. No flowers or seeds, but seems to be *Lithospermum arvense,* the Corn Gormwell, a common European weed abundant on farms in the Darling Downs. It is not known to possess any poisonous or harmful properties.

In forwarding specimens for identification and report, it is always advisable to number each specimen and retain a duplicate similarly numbered, or notes corresponding to your numbers, when names and reports can be returned accordingly.

A Beautiful Native Tree (*Ganophyllum falcatum*).

D. (Carmila, N. C. Line)—

Your specimen is *Ganophyllum falcatum,* a native of coastal Queensland, extending through New Guinea and the Malayan Archipelago to the Philippine Islands. We have not heard a local name given to it here, although it is moderately common in some parts of the Queensland coast, including some of the Islands of the Whitsunday Passage. In the Philippines it is known as *Arangen,* and, according to Dr. W. H. Brown, Chief of the Bureau of Science, Manila, the seeds of this species yield a solid fat used by some of the natives of the Philippines for illumination. The seeds are crushed and then boiled, when the oil floats on the surface. The bark, when shredded and soaked in water, yields a froth, and is said to be used in some places on this account as a substitute for soap. The berries are not known to be poisonous in any way, and we should say the tree was well worth planting as an ornamental one. The cultivation of some of these beautiful native trees is certainly to be encouraged.

Mitchell Grass.

H.M.R. (Reedley, Fresno County, California, U.S.A.)—

In reply I might state that there are four distinct kinds of Mitchell Grass in Queensland. They all belong to the genus *Astrebla.* The commonest, and, I think, the most valuable, is *Astreble lappacea* (synonym), *Astrebla triticoides*). Seed of this, and of another one, *Astrebla pectinata,* can usually be obtained from Messrs. A. Yates and Co., Ltd., Sussex street, Sydney, at 7s. 6d. per pound. The seed is very light, and I should think a pound would be quite sufficient for trial purposes for you. In your country it would probably be best sown about April, when it should ripen in August or September. The grass is not usually sown, but occurs annually in the pasture, and is mostly grazed. Sometimes it is made into hay, and is excellent for the purpose.

Asthma Plant.

G.R.P. (Brisbane)—

The specimen represents *Euphorbia pilulifera,* the Asthma Plant, a very common weed in Queensland and widely spread over the tropical and sub-tropical regions of the world. It certainly in many cases gives relief from asthma, and is not known to possess any poisonous or harmful properties. The usual method of preparation is to dry the harb in a shed or other shady place, turning it over occasionally so that it does not mildew, and making in the form of ordinary tea, about the same strength, and a wineglassful is a dose. The usual method, I think, is to let it get cold before drinking.

A Species of Native Cherry. Hoya.

S. (Townsville)—

The specimen of fruit is *Eugenia Tierneyana,* a special of Native Cherry or Lilly-pilly, common along creeks and rivers in North Queensland. Most of the Native Cherries or Lilly-pillies can be used for jam making, although we have not known anybody use the present one. When we do not know definitely the qualities of the fruit, we rather hesitate to recommend them for use, owing to one member of the family, the Finger Cherry, being so very poisonous, causing, as you know, permanent blindness, to those people who eat it. The wax-like leaf is *Hoya Nicholsonæ,* the North Queensland Hoya or Wax Flower, a common climber in some of the scrubs or rain forests of North Queensland, well worthy of cultivation, and easily propagated from cuttings.

Lantana.

P.J.W. (Samarai, Papua)—

The specimens represent a form of *Lantana Camara,* a common "Lantana" that is such a common weed pest in Queensland. The specimens were very withered when they reached me, but seem to be of the dark-red flowering forms, and these, on the whole, are not such a pest as the common form, in which the flowers come out yellow and turn to pink or lilac. Since the introduction of the Lantana Seed Fly into Queensland, the spread of Lantana certainly, we think, does seem on the decrease, although, of course, it is still a very serious pest in many places.

Coffee Senna.

W.W. (Proserpine)—

The specimen represents *Cassia occidentalis,* the Caffee Senna, a native of tropical America, now common as naturalised weeds in most tropical and sub-tropical countries. It is very common in coastal Queensland. As it and another member of the genus *Cassia* have been accused of poisoning stock from time to time in Queensland, experiments were carried out with it at the Animal Health Station, Yeerongpilly, some years ago, and it was shown to purge cattle, but to have no other ill effects. This is what one would expect, as the plant belongs to the same genus as the shrubs which produce the senna leaves of commerce. The name "Coffee Senna" refers to the fact that the seeds have been reported to be used as a substitute or adulteration for ordinary coffee.

General Notes.

Staff Changes and Appointments.

Mr. G. W. Ashford, of Gympie, has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock, and will be stationed at the Murarrie Bacon Factory.

Mr. A. R. Betts, Inspector of Stock, has been transferred from Murarrie to Upper Pilton.

The following have been appointed canegrowers' representatives on the undermentioned local sugar cane prices boards:—

Messrs. W. G. Merrill and F. W. Valentine, Cattle Creek Local Board; W. D. Davies and W. C. Ah Shay, Goondi Local Board; and T. F. Ross, North Eton Local Board.

Mr. C. Blake, Wamuran, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Mr. L. C. Vallence, Assistant to Analyst, has been appointed Analyst, Government Chemical Laboratory, Department of Agriculture and Stock.

Mr. J. M. Martin, of Kangaroo Point, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act. A similar appointment has been given to the Forest Ranger at Cardwell, Mr. G. S. R. Gentry. Honorary Rangers under the Animals and Birds Acts have been appointed in the Bundaberg district,—namely Messrs. J. C. Twyford (Avoca), J. Dittmann (Branyan), and C. G. H. A. Bock (Branyan road, Bundaberg).

Mr. J. W. Moy, Temporary Inspector, has been appointed an Inspector on probation under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts.

Plywood and Veneer Levy

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts, empowering the Plywood and Veneer Board to make a levy on all pine plywood and veneer delivered between the 23rd February, and the 2nd May, 1935, in pursuance of an order allocated by the Plywood and Veneer Board. The levy shall be used to provide for the administrative expenses of the Plywood and Veneer Board, and shall be at the following rates:—

(*a*) On plywood three-sixteenths of an inch or less in thickness and on veneer three-sixteenths of an inch in thickness at the rate of 2½d. per 100 feet face measurement.

(*b*) On plywood or veneer of a greater thickness than three-sixteenths of an inch and on veneer of a thickness less than three-sixteenths of an inch at the rate per 100 feet face measurement which bears the same proportion to 2½d. as the thickness of the plywood or veneer bears to three-sixteenths of an inch.

Dairy Products Stabilisation Act.

Executive approval has been given to the issue of an Order in Council further amending the Dairy Products Stabilisation Act, and a Regulation to provide for the expenses of members of the Dairy Products Stabilisation Board.

The amendments to the Act include the alteration of the definition of "quota." The definition, before amendment, was the proportion of dairy products manufactured during a stated period in the State that a manufacturer is permitted to sell in the course of his intrastate trade in the State. The new definition provides that "quota" shall be the quantity of dairy products manufactured in the State which a manufacturer is permitted to sell within any stated period of time in the course of his intrastate trade in the State.

Butter, Cheese, and Plywood and Veneer Boards Extended.

Orders in Council have been issued giving notice of intention to extend the operations of the Butter, Cheese, and Plywood and Veneer Boards.

It is proposed to extend the Butter and Cheese Boards for the period from 8th February, 1935, to 30th June, 1935, and the Plywood and Veneer Board from 3rd May, 1935, to 2nd May, 1936. In each case petitions for a ballot on the question of whether or not such Boards should be continued for the periods mentioned may be lodged at the Department of Agriculture and Stock on or before 18th February next.

Poole Island a Sanctuary.

Poole Island, in Port Denison, Bowen, has been declared a sanctuary under the Animals and Birds Acts, and it will be an offence to take or kill any animal or bird on such island.

Plywood and Veneer Board's Levy.

Regulations which have been issued under the Primary Producers' Organisation and Marketing Acts empower the Plywood and Veneer Board to make a levy on pine plywood at the rate of 3d. per hundred feet face measurement, such levy to be used in establishing and maintaining a fund for the purpose of subsidising manufacturers for plywood despatched outside the Commonwealth. The levy will remain in force from the 5th February, 1935, under the expiration of the present Board on the 2nd May next, and the amount of such levy shall be paid weekly to the Board on all deliveries made by manufacturers as shown by the respective weekly returns submitted to the Board.

Provision is made in the Regulations for a ballot to be taken on the question of whether or not the levy shall be made if four or more "growers" petition the Minister for Agriculture to that effect before the 4th February, 1935. Persons eligible to vote are those who own plywood and veneer plant and have produced plywood and veneer for sale.

New Bags for Imported Potatoes.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) has announced that it had been decided, as from the 1st February, to enforce the regulation under the Diseases in Plants Acts providing for the use of new bags for potatoes imported from other States.

"His attention had recently been drawn," added the Minister, "to the state of the bags being used, which, in many instances, were in a deplorable condition." All the other States insisted on the use of new bags for imported potatoes, and though a similar regulation had previously been gazetted in Queensland it had never before been strictly enforced.

Live Virus Cultures—Transmission by Post.

The Postmaster-General's Department advises that it is necessary for the following conditions to be complied with in connection with the transmission by post of live virus vaccine:—

(1) Live virus vaccine must be enclosed in a thick glass container hermetically sealed. The container must be surrounded with an absorbent substance in sufficient quantity to protect it from breakage and to absorb all the liquid in the event of it being broken. The container and its protective covering must be securely packed in another container of metal, wood, strong corrugated paper or other suitable material. The outside cover must bear the name and address of the sender and an endorsement indicating the nature of the contents of the package.

(2) The distribution and use of live virus cultures are subject to the provisions of the State laws, and the responsibility for observance of those laws lies with the persons concerned in such distribution and use.

Bullamon Plains a Sanctuary.

The property of Mr. E. B. Cameron, at Thallon, known as Bullamon Plains, consisting of portion 80, parish of Bullamon, and portions 17 and 18, parish of Gerar, has been declared a sanctuary under and for the purposes of the Animals and Birds Acts, and Mr. Cameron has been appointed an Honorary Ranger under these Acts to ensure the protection of the native animal and bird life thereon.

"A.C.F." Granite Fertilizer—Error Corrected.

It is regretted that an error has occurred in the published analysis appearing in the 1934 Annual Report of the Department of Agriculture and Stock relating to "A.C.F. Granite Fertilizer."

The correct figures are as follows:—

	Guarantee. Per cent.	Found. Per cent.
Nitrogen, as ammonium sulphate	4	4.1
Phosphoric acid, water-soluble	12	12.0
Potash, as potassium sulphate	10	10.2

From the above it will be observed that the fertilizer in question is in accordance with the guarantee.

Rural Topics.

Horse-shoeing—Points Affecting the Animal's Welfare.

The increase which was taking place in the use of horses made it desirable to direct attention to certain points which, although well known to horsemen before the trend from animal to mechanical locomotion, were now in danger of being forgotten, observed the Chief Veterinary Surgeon of the New South Wales Department of Agriculture in a recent wireless address. On the observance of these points depended the welfare of the horse and very frequently the safety of the rider.

The shoeing of horses in order to protect their feet against damage when working on hard roads was a practice of great antiquity, but it was not until well on in the nineteenth century that it was reduced to really sound principles based on the conservation of the horse's foot and the prevention of injury. During the eighteenth century, an essentially artificial age, there had come into use certain practices—such as paring out the sole of the horse's foot until it was so thin that it could be made to bend on the pressure of the fingers, cutting away of the frog, and rasping of the whole outside of the wall to make the foot appear pretty, which were quite contrary to the design of the animal's anatomy. Indeed, the inculcation of proper methods had not been so much a question of seeing that things were done but that things were left alone.

It was well to remember in dealing with the foot that whilst the outside was a hard horny case, it contained very sensitive structures, and that if bruising or damage to these soft structures occurred, the results were far more serious than would be the case if these sensitive tissues were not enclosed in the hard horny case which was the hoof. In the case of an injury to soft tissues on other parts of the body, there was room for inflammatory reaction to take place, for swelling to occur, for fluid to be poured out around the injured part without subjecting the tissues to very severe pressure; but if any of these changes took place in the soft structures enclosed in the hoof, there was no room for expansion, the pressure was very severe indeed, caused considerable pain and naturally was accompanied by lameness.

The hoof, therefore, required to be left as far as possible in its natural state. The frog should not be mutilated, the bars must be left as strong as possible, the sole should be no more touched than was necessary to remove loose flakes of horn, and the wall should be left intact, no rasping being allowed above the clinches. It was, of course, often necessary to rasp the lower part of the foot in order to shape the hoof, but even this should be reduced to a minimum. A foot so treated would, unless disease was present, have a thick strong wall, which would not be unduly damaged by the nails, and would have a large and healthy frog capable of bearing concussion without injury to the animal's legs and strong enough to keep the heels open. The sole would be tough and would act as a guard against bruising or other injury.

The surface which was to bear the shoe should be flat and even and the shoe surface which was to meet this wall surface should also be flat and even. If either the under surface of the wall or the shoe was concave where they met in apposition, then pressure would not be evenly distributed over the wall and that portion of the wall which was receiving pressure would be liable to break away from the rest.

What was known as "springing the heels" was often indulged in and in this case, while lowering the wall of the heel by having a flat surface on the shoe, a space was left between the shoe and the hoof at the heels. When the horse put his foot to the ground pressure caused this space to be obliterated, but that only followed because an undue strain was placed on the wall. If the wall was to be maintained as strong as possible it should meet the shoe evenly when at rest, and no space should be possible between the shoe and the bare surface of the foot.

Shoes if left on the hoof too long were very apt to cause damage, and it was sometimes thought that if a horse had only been carrying out light work on easy roads and the shoe was not worn, there was no necessity to remove it, but as the hoof was continually growing the relative position of the shoe on the hoof changed. If too long an interval occurred between removals of the shoe then the position of the heel of the shoe would shift from the wall on to the space between the wall and the bar. It would sink inside the wall and press on what was known as the "seat of corn." The result of this pressure would be a bruising of the sole and consequent lameness.

If such a shoe was removed and the horn was examined it would be found after the dirty top layer had been removed, that the horn below was blood-stained or black. This change had been brought about by pressure and a rupture of small blood vessels. As previously pointed out, any damage to the softer tissues inside the horny box was very painful because wherever such damage occurred swelling followed and inside the hoof there was no room for swelling without causing considerable damage to the tissues generally. Therefore, the horse's shoe should always be watched and removed for refitting, if reshoeing was not necessary, every four or five weeks.

Water Movements in Soil—Effects of Cultivation.

The value of water is impressed upon every farmer as a result of his experience. A congenial rainfall invigorates and increases his crop, whereas a period of drought may make his labours abortive. The cultivable soil is supplied with water from three sources; from the clouds, as rain or snow; from the air by absorption, as water vapour; or by condensation, as dew, and from the lower layers of the soil or subsoil by capillarity or "creeping." Artificial methods are adopted where the supply of water is insufficient.

Plants take up an enormous quantity of water—someone has estimated that a crop of oats uses up 400 tons—the greater part of which passes through the pores of their leaves as water vapour into the atmosphere. Evaporation is always taking place, and in hot, dry weather the surface soil becomes exhausted of water, and so shallow-rooted crops are liable to suffer. In windy weather the land dries up very rapidly, as evaporation is increased, owing to the immediate removal of the vapour from the surface of the soil by the agitation of the air.

Drainage has for its object the removal of surface and surplus water, thus enabling the soil to admit air and to keep up a circulation of water in the interstices. Waterlogged soil is useless for crops; independently of drainage, providing the subsoil is porous, the water will sink or creep downwards by capillarity and gravitation. In the case of an impervious subsoil a water table is formed, and the depth at which it occurs is a very important matter for the farmer to ascertain. If near the surface a water table is a source of trouble, as its presence leads to the decline of deep-rooted plants, and, moreover, the loss of water by evaporation may, at a critical time, completely exhaust the supply.

Nature ordains that the soil will store up water during the winter for the use of plants in the spring. Modern cultivation, having for its object the growth of heavy crops, including grass, necessarily entails some provision for the retention of water in the soil. Particles of rocks, earthy materials, and organic or vegetable substances, of which the soil is chiefly composed, are all concerned in the distribution of water. The vegetable fragments absorb large quantities of water, while the rocky and earthy particles retain it by clinging or surface tension. Each particle becomes wrapped, as it were, in a cloak of water of varying thickness. The thickness of the cloak depends upon the water supply, and when a very low limit has been reached the covering gradually disappears owing to capillarity absorption by rootlets and evaporation. A certain quantity of water, however, always surrounds the small fragments in the soil, and when the minimum is reached plants can no longer by their use make use of it, their power of absorption being weaker than the surface tension or clinging force of the particles.

Suppose a farmer takes a big clod in his hand and breaks it up into a dozen smaller ones, he can readily see that the latter will require a much larger amoount of water to cover their surfaces than the original mass. Hence, it is obvious that one means of conserving water in the soil is through cultivation, by which a fine tilth is produced. If one has the draught power, summer cultivation is always the best, especially on clay lands.

As already stated, the soil stores up water during winter. If ploughing is postponed until the early spring the soil not only contains less water, but the water lost during the operation is considerable. Evaporation takes place at considerable depths in the soil, depending largely on the air present, and as the surface temperature in spring is less than that below, the vapour as it rises is condensed, and so a moist surface is the result. In summer the reverse is the case, the surface temperature is the greater, and a dry condition is produced. Too much vegetable matter, as in peat soils, is objectionable, and so are too fine particles; but, if a soil is not naturally clayey, no amount of cultivation will render it so. A good soil is, in reality, a composite; it needs to have enough clay and humus to hold water, and to draw the water to the surface for plant roots when overground drought conditions require it; enough humus and clay to provide food for plants, and enough sand to make it porous, warm, and easily worked.—"The New Zealand Farmer."

Value of Lime in Pasture Making.

The value of lime in pasture making and pasture improvement is becoming more and more apparent as time goes on. Recent experiments carried out by Mr. Robert Laird, West of Scotland College organiser for Ayrshire, are described in an issue of the "North British Agriculturist" just to hand. A special grass seed mixture was sown with the idea of having one year's hay and several years' pasture. As a result of those experiments, it has been concluded that the hay yield was affected less by the composition of seed mixtures than by a number of other factors, the chief of which was the presence, or absence, of a sufficient supply of lime to assist the useful grasses and clovers in establishing themselves. The difference due to this factor was 50 per cent., as opposed to a maximum of 9 per cent. between the seed mixtures.

Points in Dairy Economy.

In a recent survey of milk production in the South-east of England, Mr. James Wyllie makes several important points with regard to dairying economy. For instance, he has a firm belief in the value of roots, especially mangolds, for milch cows (in opposition to some lately expressed opinions) and holds that if mangolds can be grown at a cost 12s. per ton, they form one of the cheapest, as well as one of the best of winter foods. Again, the production of high-quality grass and hay is of the first importance both in economy of feeding and in milk yield.

It is quite as important to reduce feeding costs as to increase milk yield, and the economic balance which gets the best results in the latter from the lowest cost of the former is a point which is only attained by experience.

Again, the most economic size for the herd for milk purposes has often been debated. Mr. Wyllie says that if the cows are to be fed mainly on purchased cakes and meals, a small herd of heavy milkers may be more economical than a large herd of moderate milkers. But if the chief foods are to be grass, hay, and roots a large herd of moderate milkers may yield better net results.

The question of labour costs is also an important one and on the average family farm financial difficulty often begins when extra labour has to be brought in and paid for. The keeping of reliable records of milk production and feeding costs is essential in order to attain the accurate figure to be placed opposite the value of the milk yield. Of course, the farmer—even the smallest—has to be something of a bookkeeper nowadays, in order to keep going, but undoubtedly a closer system, especially in connection with dairy farming, would help him materially.

Wireless Talks to Farmers.

Tuesday, 12th March, 1935—"Winter Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 14th March, 1935—"Grape Culture," by H. Barnes, Director of Fruit Culture.

Tuesday, 19th March, 1935—"Some Remarks on Animal Nutrition," Part I., by E. H. Gurney, Agricultural Chemist.

Thursday, 21st March, 1935—"Some Remarks on Animal Nutrition," Part II., by E. H. Gurney, Agricultural Chemist.

Tuesday, 26th March, 1935—"Observations on Tobacco Fertilizer Trials," by W. J. Cartmill, B.Sc.

Thursday, 28th March, 1935—"Expanding our Export Trade," by J. F. F. Reid, Editor of Publications.

Our Forest Heritage.

A sorry story of lack of foresight in the management of the mountain country of south-east New South Wales and of eastern Victoria was disclosed during the discussion on soil erosion at the Science Congress in Melbourne last month. Indiscriminate timber cutting and uncontrolled grazing, with concomitant bush fires, have greatly depreciated the value of important catchment areas, and completely ruined fertile valleys. Streams have become rushing torrents in time of rains, causing land slides and carrying silt that will, before many years, go a long way towards filling with mud the water storage and irrigation works constructed at such great expense. Mr. A. S. Kenyon, late of the Victorian State Rivers and Water Supply Commission, described the position as heart breaking, and out of the wideness of his experience was able to suggest a line of action which, he hoped, would

check the destruction. This embodies the appointment of an independent board, representative of forest, water, agricultural, and grazing interests, to control the upper catchments of streams. Mr. Kenyon expressed a belief at the congress that under reasonable control forest products could be removed without affecting the water supply to any extent. He was, however, strongly opposed to grazing in any form. The cow, he said, eats the green shoots, lets air into the forest, and ruins the forest cover. There will, probably, be some difference of opinion on the latter points, but nobody can argue seriously against the necessity for taking early action to protect mountain catchments. Only a few days ago the Prime Minister announced that the Cabinet had approved of a grant of £331,000 to the States for the encouragement of afforestation. New South Wales' share will be £50,000, and Victoria's £100,000, and it is expected that the State Governments will supplement the Federal contribution on a £1 for £1 basis. Naturally the whole of the amount will not be expended on the eastern watersheds, but it is the expressed intention of Victoria to spend some of the grant on the establishment of forest camps for youths. Thanks to the generosity of two Melbourne business men, an experimental camp was started in Gippsland, Victoria, some time back. It has done really excellent work in training youths in the management of forest areas, and it is reasonable to believe that similar camps scattered throughout the heavily timbered country would do a power of good.—"The Pastoral Review."

Soil Losses.

Our apathetic attitude towards soil losses, caused by wind and rain, was also referred to at the Science Congress. As Associate-professor G. L. Wood, who opened the question said, it is a matter for wonder that in a country so far committed to policies of State regulation, and where public utilities have been brought under public ownership to such an extent, that supervision of the greatest utility of all—the soil—should have been overlooked. There is abundant evidence that the care and protection of soil throughout Australia are inadequate, and the time has come when we must recognise that many of the activities connected with land utilisation should be re-examined from the viewpoint of their effects on soils beds in particular and on national economy in general. He added that "it is only when the disastrous results, such as gullying and increased frequency and severity of the floods are revealed, that attention is directed for a time to the reality of the peril. In a continent where rural industries are the basis of national wealth, and in which there is such a marked deficiency of water supply over such wide areas, it is difficult to understond this continued neglect by the authorities." We realise that the New South Wales Government has set up an Erosion Committee, and offers advice through its official publications in connection with checking erosion under given circumstances. Little or nothing appears to have been done in other States, however, and it is to be hoped that the strictures of scientists will awake Governments to some sense of responsibility. It is admitted that comprehensive plans to prevent soil losses in toto may not be easy to devise. It may be impossible to find a complete cure, but much can be done if the problem is attacked from the right angle. It is generally acknowledged that the removal of timber, scrub, and even pasture cover is a common cause of erosion with light sandy country. A partial solution there seems to lie in the direction of preventing further settlement of such lands without proper safeguards in the matter of wind breaks.—"The Pastoral Review."

The Stockman is an Artist.

If the cows were standard machines, like mass-produced cars, the treatment and feeding of them could be standardised, but no real stockman can ever forget the individuality of the animals he looks after. Each cow in a long byre will have its own peculiarities quite well known to the stockman. The two great indications every true stockman looks for are, firstly, the bloom on the coat, and, secondly, the state of the dung. A cow in good yield should never be hard in her droppings, and although this is true and a certain looseness is desirable, anything like real scour should be investigated at once and the cause removed and the feeding adjusted. It is occasionally necessary, if the cow has been pushed just a trifle too hard, to cut her concentrates out for a day and give her bran mashes, and bring her back to her full ration by degrees. Whatever general principles may be laid down by pundits, the real stockman will always remember that it is his job to adjust the broad general principles of feeding and management to a multitude of individual peculiarities in his charges. That is what makes a stockman's job such an interesting one.—H. E. Shand in "The Farmer and Stock-Breeder."

Be Careful with Arsenic.

At an inquest at Wagga (New South Wales) recently the Coroner found that a man had died from arsenic poisoning accidentally self-administered. The evidence disclosed that the man had been engaged dipping sheep on Brewarrina Station. Without washing and with portion of his clothing saturated with the sheep dip, he took his afernoon tea, sitting on a drum of sheep dip which had some of the dip on the top of it. The assumption was that some of his food came in contact with the poison, for half an hour later he complained of sickness and collapsed. He was admitted to Wagga Hospital but died three days later.

Horse and Tractor Cultivation Compared.

The different kinds or implements used in soil cultivation have all developed from a pointed stick whose function was to stir and break up the soil. Cultivators and harrows are in the direct line of descent from the pointed stick; the plough represents a divergence from the line, in that its purpose is to invert the soil rather than to stir it. The extremes of plough design are the sod or grassland plough which turns over an almost unbroken ribbon of soil, and the digger-breasted plough, common in continental areas, which turns over a rough broken furrow with the maximum of disruption and mixing.

Before the advent of the tractor, the design of cultivation implements and their methods of use had evolved subject to two basic considerations: a supply of cheap and abundant labour, and a forward speed of 2-2½ m.p.h. which suited the natural walk of both horse and man.

At first the tractor had little effect on these considerations—it was regarded as a more powerful haulage agent than horses, and, therefore, suitable for heavy jobs, such as stubble-breaking and deep ploughing. With further experience, and with the better designs of the tools for the lighter forms of cultivation, the scope of the tractor rapidly increased. The addition of such improvements as the power take-off and the development of power-operated implements for the hay crop opened up additional uses for the tractor as a farm tool. There is little doubt that a steady increase has taken place in the number of hours' work per year put in by the tractor on the average farm. Periodical censuses carried out by the Agricultural Economics Research Institute, Oxford, on farms employing both tractors and horses show that the hours of work of the tractor per year on all jobs are about half those put in by the horse. There is undoubtedly room for this figure to be appreciably increased; the general introduction of rubber tyres may help here.

But, desirable in many ways though this increase may be, it must be remembered that the outstanding advantage of the tractor is its ability to deal quickly with urgent work. Farming cannot be done to a rigid time-table; the weather is the controlling factor. In unfavourable seasons the farmer may be unable to work his soil when he wishes. He must produce a suitable tilth before he sows, and for this he may be compelled to wait so long that his crop, when sown at last, is almost certain to suffer in yield.

It is in such conditions, and in the preparation of land for the next crop, immediately after the current one is harvested, that the tractor finds a most useful avenue of employment. Similarly, in preparing the soil for spring-sown crops, the inevitable rush of work in the few fine spells in a wet spring can be tackled with some hope of success.

The economic value of this reserve of power, especially to the farmer on heavy land, is incontrovertible. The tractor enables him to cut costs directly, but even more important is the indirect cost-cutting, through the ability to get work completed in unfavourable spells. No costings system can show the money value of indirect savings, for obvious reasons, but no farmers would dispute their importance.

Agricultural economists have made numerous comparisons of tractor and horse costings on the farm. In common with all agricultural costing data, they present difficulties which do not arise in other industries. Take as a simple example the cost of keeping a horse. It will be fed, wholly or partly, on food grown on the farm. What figure should be assigned to this food? It should be less than the market price of the foodstuff, but to what extent? It is not even possible to state the exact cost incurred by the farmer in growing his food, since the yield is controlled, to a degree not precisely known, by the residual value of the manures applied to the preceding crops.

Some conventions must therefore be adopted, on which agricultural economists have not yet arrived at complete agreement. But, in spite of these inherent difficulties, direct comparisons of horse and tractor costings are capable of showing in what way the tractor can achieve a direct saving as compared with horse-power.

Some typical results are given in the following table, which has been constructed from figures supplied by agricultural economists. The figures, which are some years old, apply to individual farms employing both horses and tractors, and this partly accounts for the wide variations in costs for the same work. For our present purpose, however, this does not matter:—

COST PER ACRE FOR HORSE AND TRACTOR—WAGES INCLUDED.

Ploughing:
Horse, 20s., 19s. 10d., 14s. 10d., 17s. 2d.
Tractor, 15s. 9d., 14s. 6d., 11s. 11d., 8s.

Cultivating:
Horse, 2s. 6d., 4s.
Tractor, 3s. 6d., 4s. 5d.

Harrowing:
Horse, 1s. 6d.
Tractor, 3s. 6d.

Rolling:
Horse, 1s. 6d.
Tractor, 2s. 1d.

Harvest:
Horse, 2s. 7d., 2s. 8d., 2s. 1d.
Tractor, 3s. 11d., 3s. 6d., 4s. 7½d.

The salient feature of the table is that on all these farms tractor ploughing is cheaper than horse ploughing, while in all the other operations the reverse is the case. The explanation is simply that in ploughing the tractor is given a full load, while in the other operations it is working below its capacity. The practical implication is, therefore, that all tractor cultivation tools should be designed to give a full load like the plough. The modern tractor cultivator already does this, but there is still scope for the farmer to use gangs of harrows to increase the resistance for this naturally light type of cultivation.

The above results have an important bearing on the question of complete mechanisation of arable farming. Here it should presumably be easier to design the equipment and to operate it so that a full load is always given, although in most parts of the country extensive and perhaps costly alterations in the field boundaries would be needed.—From a paper on "Functions of Mechanical Power in Soil Cultivation," read at the Institution of Automobile Engineers by Dr. B. A. Keen, Assistant Director Rothamsted Experimental Station.

Better Agriculture—Philosophy of "Good Enough."

Surveying the general field of Australian agricultural education, Professor J. K. Murray (Q.), in his presidential address to the agricultural section of the Science Congress in Melbourne, deplored the fact that of all the young men about to enter grazing or farming in any one year in any one State of the Commonwealth, considerably less than 100 would have passed through a full State Agricultural College course. An outstanding feature of modern life, he said, was that, despite the spectacular successes of research, communities spent on research only a small fraction of the money willingly voted for war or defence. The Council for Scientific and Industrial Research, the Waite Research Institute, the Glenfield Veterinary Research Station and others had produced results which indicated that agricultural research in the aggregate paid in hard cash. The agricultural colleges, developed apart from University faculties and from State colleges, had been in being for many years before the first Australian faculty of agriculture was founded. They were not to remain entirely apart, however; at the founding of the Queensland University, for instance, provision was made in the status for the affiliation of the State Agricultural College. It was a very definite and easily-argued premise that sound steps in the solution of an agricultural problem depended on an adequate statement and investigation of it. Notable requirements were an adequate pasture research organisation for tropical and sub-tropical dairying conditions, for cattle and sheep conditions generally, and a dairy research institute for the elucidation of problems in production and manufacture not elsewhere satisfactorily handled. Satisfaction with a production figure of 160 lb. per cow lactation, with cheddar as practically our only cheese, and with low percentage figures of choicest in our export butter and cheese bespoke either a "good enough" philosophy, or a lack of knowledge how to do better, or a sound attitude in accordance with the economic facts of the situation.

PLATE 133.—A QUEENSLAND FARM HOMESTEAD.

PLATE 134.—PASTURE, WOODLAND, AND MOUNTAIN RANGE.
A scene in the Fassifern Valley, Queensland.

Plate 135.—Forested Slopes and Fertile Farm Land in the Fassifern Valley.

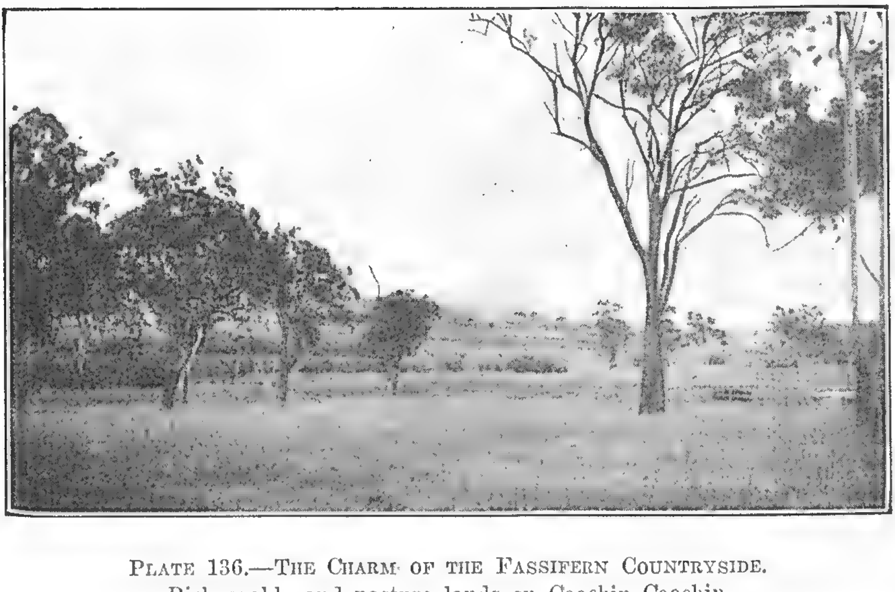


Plate 136.—The Charm of the Fassifern Countryside.
Rich arable and pasture lands on Coochin Coochin.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE TEETH OF OUR PEOPLE A NATIONAL DISGRACE.

The Extent of the Evil.

IN Sydney last August a combined meeting of medical men and dentists debated at length the causes of our bad teeth. On two points there was universal agreement. Firstly, as to the extent and importance of this evil. It was agreed that from 90 to 95 per cent. of our children have imperfect teeth, and that after childhood some diseases of the teeth is almost universal. Its bad effects on general health were recognised by all present. One medical authority was quoted as having stated that 20 per cent. of all chronic diseases were due directly or indirectly to the teeth. Another had traced over twenty-eight systemic diseases to the same cause.

Faulty Diet is the Cause.

It was also agreed by all that the condition of our teeth is caused by what we put into our mouths. In other words, it is the result of the foods consumed by civilised peoples. To find perfect teeth nowadays we must search out primitive races living on primitive diets, and even these are beginning to be hard to find. It is interesting to know that in the Eskimo language there is no word for toothache, and that the Maoris living under native conditions had almost perfect teeth. But when primitive races take to civilised diets their teeth rapidly become as bad as ours.

Differences of Opinion.

As to the exact method by which our civilised diet destroys our teeth there was much difference of opinion. Most of the speakers had each his own theory. Not content with advocating this, each considered it necessary to discredit every other theory. At first reading this is very confusing; but a little reflection makes it appear probable that the true explanation is more complex than many allow, and that the inability to admit more than one mode of causation is a human weakness that we should do well to avoid.

Two diseases are recognised. Firstly, the decay of teeth, or dental caries, which is most prevalent in childhood, but extends throughout life; and, secondly, a disease of the tooth-sockets known by the ugly and often misused term pyorrhœa. The latter is a disease of adult life, though its early beginnings may be traced in childhood. As our space is limited we will deal only with the former. For this three main explanations, with some differences of detail, were offered.

Weakly Built Teeth.

Careful research has recently shown that a very large percentage of both temporary and permanent teeth are of poor structure and

imperfectly calcified. There can be no doubt that such teeth will decay more easily than strong well-formed teeth. When such teeth emerge with fissures or pits, they are actually inviting caries. The liability of a tooth to destruction depends largely on its structure. To make good teeth an abundant supply of Vitamin D and a sufficiency of calcium and phosphorous are needed, more particularly when the diet consists largely of cereals (bread, flour, oatmeal). These necessities are supplied by milk, butter, cheese, eggs, liver, and green vegetables. The diet of the expectant mother is usually deficient in milk and green vegetables. For the infant and young child the addition of cod liver oil is recommended. On such a diet even caries that has already commenced may sometimes be arrested.

We cannot agree with those who see no other cause than this. Even though teeth are weak and easily destroyed, there must be some exciting cause. Even the weakest bridge does not break down until it bears some load, and a flawed cricket bat will not split until it hits a ball. There must be some further cause for caries besides structural defects.

Poorly Developed Jaws from Want of Use.

Great importance is placed by some on the use of the jaws by the developing child. Soft pappy foods so popular with mothers do not provide this exercise. A limb which is disused does not develop properly, and the same is true of the jaws. If the jaws are underdeveloped the teeth are overcrowded and underdeveloped also. What the child needs is plenty of hard, dry, crisp food.

Though too much weight may be attached to this factor, we agree that it is of real importance.

Erosion of the Teeth by Acids.

Acid fruit juices are harmless, for they excite a flow of saliva by which the acids are neutralised. Indeed, they exert a beneficial cleansing effect. The dangerous foods are soft and well-cooked starches, or sugar and starch given in such a way as to produce a sticky mass, for instance, chocolate, sticky sweets, sweet cakes and biscuits. Even bread may be harmful. All of these undergo an acid fermentation and cause decay in any tooth area protected from natural cleansing by lips and tongue, that is, in fissures and pits in the teeth, and in interstices between the teeth. Here we have a cause increasingly prevalent in modern diets. Cheap, satisfying, tasteful, backed up by great commercial interests these tooth-destroying foods have an irresistible appeal to those who "eat what they like."

The Moral.

Let expectant mothers take plenty of good fresh milk and green vegetables. Let all babies be breast-fed wherever possible. Let those artificially fed have some cod liver oil. Let every child take a pint of milk daily. Give your children more potatoes and less bread. Especially do not give them bread between meals. After all meals containing bread see that their teeth are well cleaned. Cut out all chocolates, sticky sweets, and biscuits made out of finely ground flour. Give children hard crisp food instead of pap and mush, and don't be afraid of letting them use their teeth. Foods that are good for children are good for mothers also, and if mothers will eat them they will have no difficulty in getting their children to do so.

IN THE FARM KITCHEN.

ART IN BOILING AN EGG.

Thus Janet L. Rankin, in "Eggs," a publication devoted to the Poultry Industry:—Appetising, nourishing, quickly and easily prepared, eggs in their simpler forms are, she states, amongst our most valuable foods. Like milk, they are a tissue-building food, and, if properly cooked, contain all the vitamins in their most easily digested form. So many recipes go wrong because the method, rather than the recipe, is at fault; so it would be as well first to understand how to treat eggs for the different functions for which you intend them.

There is one definite rule I would give you which applies in all cases: Never cook eggs at a high temperature. Eggs begin to set (or coagulate) at 170 degrees to 176 degrees F. Water does not boil until it reaches 212 degrees F., so when an egg is placed in merrily bubbling water it is being subjected to nearly 50 degrees more heat than it needs, and it is, consequently, far tougher and less easily digested than it ought to be.

The very expression, "boiled egg," should never have come into being, for no egg ever should be boiled. The best way to "cook" an egg in its shell is to put it on in cold water, and when it comes to the boil remove from the heat and leave it for one, two, or three minutes, according to whether soft or medium cooked eggs are liked. This will give a delicate, tender texture.

A poached egg, as a rule, is not subjected to such fiery treatment, for, if it were left over great heat, the albumen would soon break up and harden and boil over the sides of the pan, as if in protest.

So, while this low temperature principle is in your mind, we will go right on to the important summer function of the egg, when it acts as a thickening agent. What can equal the smooth, velvety thickness of a well-made egg custard, and it is so simple if the eggs are properly treated. The other day a town friend said to me: "I always use custard powder, as my egg custards always curdle." She put the accent on "curdle" as if it were the fault of the eggs, poor things, so I explained my golden rule: "Never cook eggs at too high a temperature"—and now she is beating me at my own game!

There are two ways of making satisfactory custards and sauces—one is to place the saucepan over a low flame and watch it like a cat watching a mouse, stirring intelligently all the time until the mixture thickens. The other way is to use a double saucepan, also over a moderate heat. I prefer the latter, and when a double boiler is not available, I use a bowl or jar stood in a pan half full of hot water. For baked puddings, custards, and pies, which contain an important proportion of eggs, these we set in a dish or pan of warm water in the oven, just as we set the saucepan over another containing hot water.

My foundation recipe for "boiled" custard (do not forget, it should never actually boil!), one pint milk, two large eggs (or three small ones), two tablespoonfuls sugar, one-eighth teaspoonful salt. Flavouring to taste (lemon rind, vanilla, cinnamon, &c.). Scald the milk with the flavouring in the double saucepan. Beat the eggs slightly, add the sugar and salt, and then gently add the scalded milk, stirring all the time (remove any lemon rind, &c.). Return the mixture to the saucepan and stir until thick and smooth.

A very good variation of the above is made by using three large eggs instead of two, separating the yolks from the whites. Use the yolks for thickening, as in previous recipe. Whip the whites very stiffly and fold in lightly at the last. This makes a delicious spongy custard, ideal to trifles or for serving with fruit.

TOMATO RECIPES.

EACH year the prestige of the tomato as an item of food is enhanced. In America tomato-juice as a cocktail has largely supplanted the more potent variety. As soup, salad, and savoury it appears in a score of ways. The recipes given cover dishes hot and cold, simple and rich.

Tomato Souffle.

Take 1 cup tomato pulp, 1 tablespoonful butter, 2 tablespoonfuls grated cheese, 3 eggs, ½ cup breadcrumbs or crumbled granose biscuits, 1 teaspoonful made mustard, salt, and pepper. Mix together all the ingredients except the eggs and bring to the boil. When cool add the beaten egg-yolks, and lastly the egg whites beaten very stiff. Pour into a buttered dish, sprinkle with breadcrumbs and a little grated cheese, and bake in a hot oven for 15 minutes.

Tomato Savoury.

Take a number of pieces of hot buttered toast and the same number of thick slices of tomato. Dip the tomato slices in egg and cracker crumbs and fry in butter. Place on the toast, sprinkle with grated cheese and chopped capers, season with pepper and salt, and put in the oven till the cheese is browned.

Tomato Fritters.

Take 2 eggs, ½ cup self-raising flour, pinch salt and pepper, and a teaspoon of chopped parsley or sage. Make a batter with a quarter of a cup of milk, cut some tomatoes in thick slices, dip in batter, and fry to a golden brown.

Tomatoes and Peas.

Take three or four firm medium-sized tomatoes, cut them in half and scoop out some of the pulp. Season with pepper and salt and a finely-chopped onion, place in a buttered dish, and bake in the oven for about ten minutes. Prepare ½ pint rich white sauce, add to it two beaten egg-yolks, and stir over the fire till thick. Season with pepper and salt and a pinch of chopped mint, add two cups of carefully-cooked green peas, make all thoroughly hot, and, when the tomatoes are cooked, fill with this mixture and serve.

Stuffed Tomatoes.

All sorts of tasty little odds and ends may be used for stuffing tomatoes. Use firm tomatoes, cut a slice from the top, and scoop out some of the pulp. Mix with the pulp some grated cheese and breadcrumbs, minced meat, chicken, or ham, smoked or free cooked fish, mushrooms, or celery. Flavour with pepper and salt, refill the tomatoes, sprinkle with fine breadcrumbs, and place on the top of each a small piece of butter. Bake in a moderate oven for twenty minutes.

Tomato Toast.

Take 1 ripe tomato, 1 egg, 1 oz. cooked ham, ½ oz. butter, a flavouring of onion, salt, and pepper. Peel the tomato, cut up, and mince the ham and onion. Melt the butter, add the tomato, and cook for a few minutes, stirring all the time. Take from the fire to cool slightly, add the beaten egg, stir over the fire till it thickens, and serve on hot buttered toast.

Tomatoes with Cheese Cream.

Take 3 or 4 tomatoes, 1 gill cream, 1½ oz. grated parmesan cheese, 2 tablespoonfuls aspic jelly, salt, and pepper. Cut the tomatoes in half, remove some of the pulp, and drain them. Whip the cream stiffly, season with salt and pepper, whisk in the aspic jelly, which should be liquid, but cold. Add the grated cheese, fill the tomato shells, and pipe a pretty border with a rose-pipe. Garnish with cress and serve very cold.

Stuffed Tomato Salads.

Take firm tomatoes, of uniform size (if very large, cut them in half; if small, cut a slice from the top). Scoop out some of the pulp and drain the tomato. Fill with the following fillings, or with any other savoury mixture on hand:—

(1) Pickled walnuts, new cold potatoes, chopped parsley, and mayonnaise.
(2) Chopped celery, shredded pineapple, and mayonnaise.
(3) The heart of a small cabbage finely shredded, 1 tablespoonful grated onion, and some mustard dressing.
(4) Chopped ham, mixed with aspic jelly and a little of the tomato pulp. Season well, fill the tomatoes, and set on ice.
(5) Put the pulp on the fire, add 1 teaspoonful of gelatine, and cook. Add some diced beetroot, chopped gherkins and capers, and fill the tomato-cases.

Tomato Moulds.

Peel some tomatoes and scoop out some of the pulp. Fill with chopped celery and a little mayonnaise dressing. Lime small moulds with aspic jelly, and, when set, put in each a filled tomato. Fill the moulds with aspic jelly, set on ice, and turn out on a lettuce leaf.

Tomato and Apple Salad.

Place a thick slice of tomato on a lettuce leaf. Shred some lettuce very finely and mix with mayonnaise. Place some on the top of each slice of tomato, then a tablespoonful of very finely shredded apple, mixed with a little chopped mint.

Tomato Sauce.

This sauce may be served with any meat, fish, or vegetable entrees. Take 2 oz. butter, 2 oz. flour, 1 lb. tomatoes, 1 small onion or eschalot, pinch of sugar, pepper, and salt, 1 oz. ham or bacon, ½ pint stock or water. Melt the butter in a saucepan, fry the chopped onion and ham, add the flour, brown slightly, stir in the stock or water, and bring to the boil. Add the tomatoes and cook for half an hour. Strain and season.

Tomato Relish.

Take 5 lb. tomatoes, 1½ lb. apples, 4 lb. sugar, 1 pint vinegar, ¼ oz. cinnamon bark, ¼ oz. ginger, 3 blades of mace, and a few cloves. Cook slowly till quite thick, and, when cool, bottle in jars. It is delicious for sandwiches or flavouring, and may be used with cold meat.

Tomato and Pineapple Jam.

Take 6 lb. firm tomatoes (peeled and sliced), 1 large pineapple cut into dice, 4½ lb. sugar, pinch of salt, and the juice of 3 lemons. Boil the pineapple with 1 lb. sugar until it is soft, add tomatoes and the rest of the sugar, and boil rapidly for about one hour. Add lemon-juice and salt and test on a plate to see if it will set when cool. When ready remove from the fire and bottle while still hot.—E.S., in the "Sydney Morning Herald."

Tomato Jam.

Wash and stem the tomatoes, place in cooking vessel, crush sufficient of the fruit to start boiling, and reduce the whole to pulp by boiling, say for half to three-quarters of an hour. Strain all the pulp through a ¼-inch mesh sieve and weigh. Add ¾ lb. sugar for each pound of pulp, and bring to the boil. The cooking time cannot be stated definitely, there being many influencing factors. Fast boiling for approximately an hour to an hour and a-quarter will produce the desired consistency.

As tomato jam made to this recipe is inclined to be insipid, the addition of a little acid in the form of citric or tartaric or pineapple, &c., is a decided improvement. The addition of acid should be done when the jam is about half cooked, and at the rate of 1 oz. to 25 lb. of pulp. Lemon juice may be substituted for tartaric, and if it is desired to use the whole lemons, they should be cut up into very thin slices and boiled for, say, half an hour before being added to the jam.

Apple pectin added to tomato jam has proved a decided success, supplying bulk, combination, and acid in one.

POINTS IN JAM-MAKING.

Use the best crystallised sugar.

The fruit should be sound and not too ripe.

Boil fast, as this preserves the colour and flavour.

Stir as little as possible, for stirring breaks up the fruit and renders it more liable to burn.

Make small quantities at a time; large quantities are not always a success.

Skim off impurities and do not use iron or tin preserving pans.

Use a wooden or an aluminium spoon for stirring.

Seal the jars down perfectly to keep airtight.

Store in a dry, dark pantry.

VEGETABLES AND HOW TO COOK THEM.

Vegetables, as they are ordinarily spoken of, may be classified as (1) fresh—(*a*) starchy, e.g., potatoes, parsnips; (*b*) non-starchy, e.g., cabbage, carrots, lettuce, spinach; and (2) dried—being the ripened seeds of certain plants, such as peas and beans.

Food Value of Vegetables.

The food functions of these two classes of vegetables are distinctly different. The fresh vegetables are composed chiefly of water, most of them containing over 80 per cent. of it. In so far as nutriment is concerned, they are of little value. Some of the vegetables, such as potatoes, beets, carrots, parsnips, &c., do contain a considerable quantity of starch and sugar, which produce heat and energy in the body, but it would be more economical to obtain this from other sources of food such as bread and cereals.

The fresh vegetables have specific purposes in the human diet which no other foodstuff can supply.

(1) They are one of our most valuable sources of mineral salts. These salts are mostly compounds of potash, which are most valuable anti-scorbutics or blood regulators. A deficiency of green vegetables sometimes causes eczema.

(2) Fresh vegetables supply ballast to the intestines. The cellulose or indigestible fibrous material they contain is a stimulus to the movement of the intestine; hence their special value in constipation.

The dried vegetables have a higher food value, being so rich in protein that they have been described as "the poor man's beef." The mineral matter in these vegetables is composed largely of potash and lime.

Cooking of Vegetables.

Knowing the importance of the generous use all the year round of vegetables in the diet, it is worth while considering the best methods of cooking.

Following general rules, to obtain good results in cooking fresh vegetables, it is important that they should be crisp and firm. If not taken directly from the garden, they should be crisped in cold water before cooking. Cabbage and cauliflower should be soaked for one hour in cold, salted water. When cooking vegetables, they should be put in fresh, boiling water. Use one teaspoon salt to each quart of water, but do not add until vegetables are almost done as salt tends to harden the tissues. Use only enough water to prevent burning.

Strong-smelling Vegetables.

There has been rather general belief that strong-smelling vegetables, like cabbage, onions, and cauliflower, should be closely covered and simmered or cooked just below boiling point. It has been found that these vegetables can be left uncovered and allowed to boil rapidly without leaving any noticeable odour in the room. A larger amount of water must be used than in the case of mild-flavoured vegetables. A crust of bread put into the water and cooked with the vegetables will assist in dispelling the odour. The addition of soda destroys the vitamin value and therefore should not be used.

Time of Cooking.

Vegetables should be cooked until tender, but overcooking breaks up and wastes them, and in some cases develops undesirable flavours. As soon as the vegetables are tender, they should be drained and seasoned. If the vegetable water is saved and used in making a sauce, so much more of the flavour and mineral salts are retained. This method is particularly good for young carrots, asparagus, and some of the more delicately-flavoured vegetables.

Cooking Dried Vegetables.

The important point in cooking dried vegetables—ripe peas, beans, and lentils, which are rich in protein or tissue-building material, is not to cook them at too high a temperature. The protein, which is called legumin in these plants, like the protein in egg-white or meat, is toughened by strong heat. To avoid this, they should be simmered or cooked just below boiling point. On account of the dense, tough texture of these vegetables, and the small quantity of water they contain, they should be soaked overnight to soften the cellulose and shorten the

time of cooking. The soaking also improves the flavour by dissolving out a bitter substance. It is also important that the water in which they are cooked be softened, either by adding a little baking-soda or boiling the water before it is used to get rid of the lime, as lime has a tendency to toughen the legumin. When beans are large, like lime beans, the tough outer skin is sometimes removed when it has been loosened by soaking, as the skins make the digestion difficult for some people. This difficulty is overcome where the beans are made into soup. The dried vegetables, being themselves so rich in protein, should be served as a meat substitute rather than with meat.

The general rules, then, for cooking dried vegetables, would be to wash them and soak them overnight in water softened by adding one quarter of a teaspoon of baking soda to one quart of water. In the morning, drain, rinse, and put on to cook in cold water; let come to a boil, drain, cover with boiling water, and simmer until dry.

NOTICE TO SUBSCRIBERS.

SPECIAL AND IMPORTANT.

Under the Commonwealth Postal Regulations it is NO LONGER PERMISSIBLE to indicate the expiry of subscriptions with a BLUE CROSS on the first page of the Journal. So in the future that reminder will NOT appear.

The need for the strictest economy makes any other form of reminder at present impracticable. THE ONUS OF REMEMBERING THE DATE OF EXPIRY OF, AND RENEWING THE SUBSCRIPTION PROMPTLY IS, THEREFORE, PLACED ON EACH SUBSCRIBER.

As about 1,000 subscriptions expire each month, the cost of a postal reminder is, in present circumstances, prohibitive. Readers will, therefore, appreciate that fact, and will, no doubt, help us to retain their names on our mailing list by kindly noting the date of payment of their subscriptions and, on expiry, sending in their renewals at once.

Instead of just sending the annual subscription—one shilling—along, it is suggested that, when renewing, they do so for two or three years, or even a longer term. For instance, FIVE SHILLINGS would keep a name on our subscribers' register for FIVE YEARS.

By doing this subscribers would help greatly in reducing clerical labour, as well as avoid the inconvenience to themselves of posting annually the very small sum necessary for their registration.

Readers renewing their subscriptions should USE THE ORDER FORM on another page, which should be filled in FULLY and CORRECTLY. Renewals by letter do not as a rule give the essential information, thereby causing unnecessary waste of time and much inconvenience. The Form is also our record, and orders which come by letter require special handling to adapt them to our card recording system.

When an address on the Order Form is not that to which the Journal has hitherto been sent, attention should be called to the new address, and the former address given. This assists us to identify subscribers, of whom we have many of the same name, often in the same district, as well as in different parts of the State.

Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

Orchard Notes for April.

THE COASTAL DISTRICTS.

IN the Orchard Notes for March the attention of citrus-growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known as blue mould—a rotting of the fruit caused by a mould fungus—and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus-growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that blue mould cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing blue mould can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury. The cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and blue mould follows in due course.

The remedy for blue mould is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of blue mould or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For oversea and interstate markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to export, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, for from now until the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, firstly, to retain moisture in the soil, and, secondly, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly-cleared land time to sweeten before planting.

Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth, and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of Bordeaux mixture, a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in—every effort should be made to bring the seed-bed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

HOW MANY TURNS TO THE ACRE?

A man driving a team ought to know what distance he must travel with a given width of machine to cover an acre. It can be ascertained by dividing the width of cut of machine in feet into 660. Thus a 6-feet harvester travels 110 chains to do an acre, a 10-feet machine 66 chains, and so on.

TO UNREEL BARBED WIRE.

Run an iron rod through the roll of wire and over each end of the rod slip a small jam tin with a hole in the centre of the bottom. Then loop a trace chain over the end of the rod at each side and attach a swingle-bar to the middle of the chain. The free end of the wire is fastened to a post and a horse hooked to the swingle-bar on the wire and the roll pulled along. The wire not only comes out straight, but most of the slack is taken up and there is very little straining to do.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.,	No. of Years' Records.	Jan., 1935.	Jan., 1934.
North Coast.	In.		In.	In.
Atherton	12·30	34	5·01	22·09
Cairns	16·91	53	5·58	23·72
Cardwell	17·25	63	2·36	46·17
Cooktown	14·58	59	10·82	16·03
Herberton	9·78	49	6·34	18·66
Ingham	16·05	43	3·61	31·23
Innisfail	20·69	54	7·10	35·60
Mossman Mill	18·15	22	18·97	33·75
Townsville	11·16	61	2·76	13·87
Central Coast.				
Ayr	11·19	48	0·93	9·60
Bowen	10·15	64	2·37	8·06
Charters Towers	5·51	53	3·02	6·93
Mackay	14·33	64	4·34	5·38
Proserpine	16·01	32	7·04	7·75
St. Lawrence	9·34	64	5·58	0·87
South Coast.				
Biggenden	5·26	36	3·15	0·39
Bundaberg	8·82	52	2·97	1·28
Brisbane	6·44	84	5·75	3·26
Caboolture	7·65	48	5·96	4·34
Childers	7·51	40	4·81	1·28
Crohamhurst	12·53	42	7·45	9·21
Esk	5·71	48	6·18	4·83
Gayndah	4·63	64	2·24	0·52
Gympie	6·66	65	3·74	3·24
Kilkivan	5·55	56	4·44	2·79
Maryborough	7·21	64	4·66	2·44
Nambour	9·76	39	6·67	4·98
Nanango	4·64	53	5·78	2·14
Rockhampton	7·74	64	4·11	1·77
Woodford	7·86	48	5·23	5·75

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.,	No. of Years' Records.	Jan., 1935.	Jan., 1934.
Central Highlands.	In.		In.	In.
Clermont	5·15	64	2·40	1·78
Gindie	3·73	36	..	0·08
Springsure	4·20	66	4·49	0·29
Darling Downs.				
Dalby	3·26	65	7·02	2·13
Emu Vale	3·21	39	3·05	3·89
Hermitage	3·26	29	..	3·67
Jimbour	3·49	47	3·84	1·56
Miles	3·63	50	5·23	3·77
Stanthorpe	3·58	62	4·00	4·06
Toowoomba	5·08	63	3·34	5·42
Warwick	3·56	70	2·50	3·90
Maranoa.				
Roma	3·09	61	2·76	0·55
State Farms, &c.				
Bungeworgorai	1·78	21	2·76	0·54
Gatton College	4·30	36	3·73	4·54
Kairi	9·87	21	2·42	20·82
Mackay Sugar Experiment Station	14·32	38	3·75	5·01

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JANUARY, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·72	91	72	104	17	67	7	1,145	12
Herberton	..	85	66	92	17	60	13	634	12
Rockhampton	29·79	92	73	98	1	68	21	411	5
Brisbane	29·84	87	69	95	1	61	7	575	10
Darling Downs.									
Dalby	29·82	88	64	94	27	53	7	702	8
Stanthorpe	..	82	58	90	27	44	7	400	8
Toowoomba	..	83	62	92	27	49	6	334	10
Mid-Interior.									
Georgetown	29·74	97	75	104	1	69	7, 29	530	9
Longreach	29·72	104	75	112	1	60	7	112	1
Mitchell	29·77	95	67	104	28	50	7	105	5
Western.									
Burketown	29·71	95	79	104	1	70	19	1,537	7
Boulia	29·71	103	77	112	12	65	7	112	6
Thargomindah	29·76	99	74	109	12	62	6, 7	30	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

	March. 1935.		April. 1935.		Mar., 1935.	Apr., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·45	6·25	6·2	5·50	12·56	3·9
2	5·45	6·24	6·3	5·49	2·2	4·17
3	5·46	6·23	6·3	5·48	3·12	5·23
4	5·46	6·21	6·4	5·46	4·22	6·29
5	5·47	6·20	6·4	5·45	5·31	7·34
6	5·48	6·19	6·5	5·44	6·37	8·41
7	5·48	6·18	6·5	5·43	7·44	9·45
8	5·49	6·17	6·6	5·42	8·51	10·45
9	5·50	6·16	6·6	5·41	9·57	11·39
						p.m.
10	5·51	6·15	6·7	5·40	11·1	12·27
11	5·51	6·13	6·7	5·39	12 noon	1·11
					p.m.	
12	5·52	6·12	6·8	5·38	12·57	1·48
13	5·52	6·11	6·8	5·37	1·47	2·20
14	5·53	6·10	6·9	5·36	2·38	2·51
15	5·54	6·9	6·9	5·35	3·15	3·18
16	5·54	6·8	6·9	5·35	3·49	3·48
17	5·55	6·7	6·10	5·34	4·21	4·18
18	5·55	6·6	6·10	5·33	4·48	4·48
19	5·56	6·5	6·11	5·32	5·17	5·24
20	5·56	6·4	6·11	5·31	5·47	6·5
21	5·57	6·3	6·12	5·30	6·19	6·51
22	5·57	6·2	6·12	5·29	6·51	7·44
23	5·58	6·1	6·13	5·28	7·25	8·40
24	5·58	6·0	6·14	5·26	8·5	9·42
25	5·59	5·59	6·14	5·25	8·53	10·46
26	5·59	5·58	6·15	5·24	9·47	11·53
27	6·0	5·57	6·15	5·24	10·46	a.m.
28	6·0	5·55	6·16	5·23	11·48	12·57
29	6·1	5·54	6·16	5·22	a.m.	2·2
30	6·1	5·53	6·17	5·21	12·54	3·5
31	6·2	5·52			2·4	

Phases of the Moon, Occultations, &c.

5 March ● New Moon 12 40 p.m.
12 ,, ☾ First Quarter 10 30 a.m.
20 ,, ○ Full Moon 3 31 p.m.
28 ,, ☽ Last Quarter 6 51 a.m.

Perigee, 4th March, at 9.54 p.m.
Apogee, 17th March, at 2.36 p.m.

Neptune, on the 4th, will be in opposition to the Sun, rising as the Sun sets. Its distance from the Earth, about 2,885 million miles, makes this huge planet invisible to the naked eye, but with a telescope it will be in a favourable position to be picked up later in the evening if sufficient time and patience are used to select it from some small stars in the hind leg of the Lion.

Jupiter, apparently near the eastern border of Libra (Right Ascension 15.25), will become stationary on the 10th, then appear to move westward till it reaches a degree north of the brightest star, Alpha Libri, on 14th July. On the 15th Mercury will be at its greatest elongation, 28 degrees west of the Sun. As the Sun will reach the first point of Aries about midnight on the 21st, and the Equinox will then occur, every observer who keeps a careful note of the place on the horizon at which the Sun rises will have his east point most exactly. By noting the point where the Sun sets on the 21st or 22nd, he will be able to draw a line, say 10 or 12 feet in length, pointing exactly east and west from which his meridian, or south to north line, can be drawn at right angles. With the use of a plumb-line, it would then be possible to see when the shadow of it agrees with the Meridian, at what time it is really mid-day.

The planets Venus and Uranus will be within half a degree of one another, and will be well placed above the western horizon for an observer with telescope or binoculars, about half-an-hour after sunset on the 22nd. The part of the sky in which they will be situated is just about where Aries, Pisces, and Cetus meet. A little later Mercury will be somewhat nearer apparently to Saturn, but both will set 1 hour 12 minutes before the Sun. At 3 a.m. on the 25th, when Jupiter is on the meridian, it will be 6 degrees (length of Cross) north of the gibbous Moon.

Mercury rises at 4.12 a.m. on the 1st, and at 3.38 a.m. on the 15th.

Venus sets at 7.38 p.m. on the 1st, and at 7.28 p.m. on the 15th.

Mars rises at 8.38 p.m. on the 1st and at 7.41 p.m. on the 15th.

Jupiter rises at 10.5 p.m. on the 1st, and at 9.10 p.m. on the 15th.

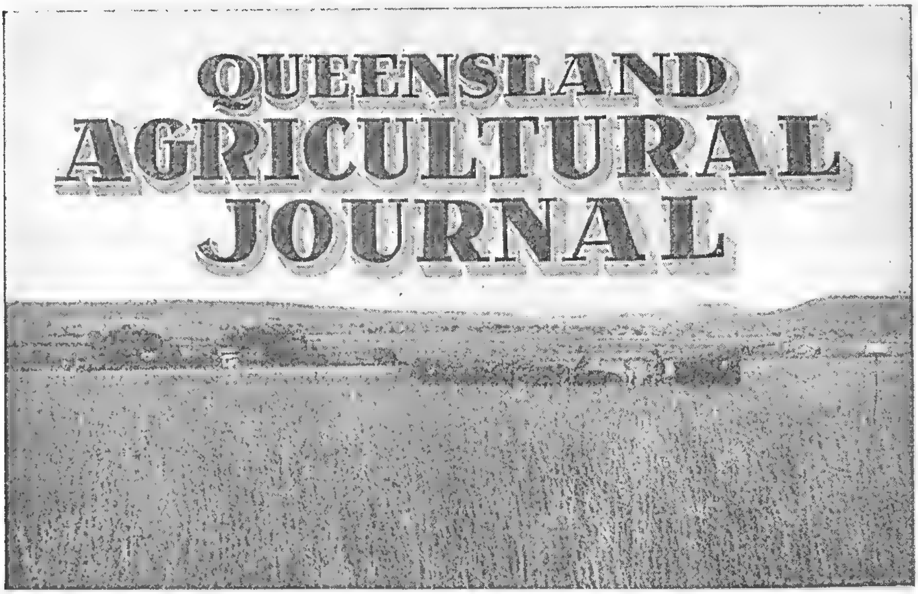
3 April ● New Moon 10 11 p.m
11 ,, ☾ First Quarter 3 42 a.m.
19 ,, ○ Full Moon 7 10 a.m.
26 ,, ☽ Last Quarter 2 20 p.m.

Perigee, 2nd April, at 6.12 a.m.
Apogee, 14th April, at 5.48 a.m.
Perigee, 30th April, at 2.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.



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The Queensland Sugar Industry.

Premier's Address to Cane Growers' Council.

"CRITICISM of the Commonwealth Government in renewing the sugar agreement came chiefly from a State that benefits very largely by the arrangement made by the Commonwealth in regard to wheat. **There is no difference in principle between establishing a home price for wheat than there is in establishing a home price for sugar,** and Victoria, South Australia, and West Australia reap the major benefit from the wheat agreement."

The Premier (Hon. W. Forgan Smith) made the foregoing statement when opening the ninth annual conference of the Queensland Cane Growers' Council on 18th March, and in the course of an important address he described his negotiations on behalf of the sugar industry when in England last year. The conference was representative of every sugar district in the State, as well as of the Northern Rivers of New South Wales. The Premier's address was listened to with the closest attention, and at frequent intervals his remarks were warmly applauded.

The Premier said:—Conferences of primary producers are of great value to a State such as Queensland, dependent upon the prosperity of its producers. The sugar industry occupies a position of major importance amongst the primary industries of Queensland, because of the high percentage of employment involved and the benefits of such employment—not only to Queensland, but to Southern manufacturers. We realise, of course, that in return for the embargo and price paid by the people of Australia we must reciprocate in purchases of Southern products, and statistics show that we have carried out this obligation to the full, so much so that the balance of trade actually is in favour of the Southern States.

Mission to Great Britian.

The year since your last conference has been filled with very many important matters affecting your welfare. At the invitation of the

sugar producers of Queensland, I visited Britain and investigated the sugar position at first hand, as well as the marketing of Queensland products generally. As published, the opportunity was taken of my visit to London to reorganise the British Empire Producers' Organisation, and it is confidently expected that this reconstitution will be beneficial to Australian industry. I also brought under the notice of the British Ministers certain factors in connection with the renewal of the Preference Agreement for a long term. The Acting Agent-General (Mr. L. H. Pike) is in close touch with the Government and will take whatever preliminary action is necessary immediately the report of the British Sugar Inquiry Committee is available. It is apparent, from the delay in the presentation of this report, that the British Government is having some difficulty in arriving at its decision. Unfortunately, no permanent improvement in prices on the world's markets has yet been manifested. On the contrary, as all of your are no doubt aware, prices receded last November to the lowest level ever recorded—foreign sugar having been sold on the British market at less than £4 per ton. Although it does not seem that anything less than that price should be possible, it must be remembered that this very unremunerative return was reached —if anything very low can be said to be reached—by practically slave conditions in the principal exporting country of the world (Cuba), and you will have noticed from the Press reports of revolutionary movements as a consequence.

Commonwealth Sugar Agreement.

The published notification of the Commonwealth Government's intention to renew the sugar agreement will have the effect of stabilising this industry. The Government has advised the Prime Minister of the acceptance by the industry's representatives of the conditions announced by Mr. Lyons, and now awaits receipt of the draft agreement. When in the South in February, I discussed the proposal with the Prime Minister, who gave me certain assurances, and it is pleasing that, in the interests of Australia, as well as of Queensland, the stabilisation announcement was made to enable the preparation and planting of the coming crop to proceed. Whilst there have been objections voiced, more particularly in Victoria, it is mostly being fanned by the freetrade and tariff reform leaguers, and, in view of the fact that the balance of trade is in favour of Victoria, it is difficult to follow that State's objection. It was pleasing to see the Australian manufacturers' secretary voicing his approval of the renewal of the agreement. When the principal objective of all governments is the creation of employment and the stabilisation of rural industries, it is indeed strange that any objection should be made to an industry such as yours, in which such a high percentage is disbursed in wages, with beneficial effects to other manufacturing industries in Australia. Regarding the agreement, the only details available are those published, and the main alteration is an additional assistance of £16,000, making £216,000 to your fellow-producers of the fruit industry.

I may say that during my interview with Mr. Lyons recently I furnished him with the latest information regarding British preference which may come up for discussion on his visit, and I have placed at his disposal the services of Mr. Pike, who is thoroughly *au fait* with the situation. In this connection a lecture delivered by Mr. Pike in London —as reported in the Brisbane "Telegraph" of 12th March, 1935—is particularly appropos at the present moment and has its lesson for Australia.

I observe from your agenda that many matters are listed which are of great importance. I can assure you that your conclusions, provided that such are the general desire of the whole industry, will always

receive the same sympathetic consideration of the Government as has been given in the past. A great responsibility rests on you. You are faced with the dictum of the Commonwealth Government regarding over-production. You have been kept advised by my office of the overtures of the Chadbourne people, and you must keep abreast of the world situation insofar as it affects sugar. These are all matters which, no doubt, will have your attention at the conference, but you can rest assured that the Government is alive to your interests, which, after all, are the Government's interests—that is, the welfare of the Australian cane sugar industry.

The Spirit of Co-operation.

It is necessary for me to enlarge a little on one phase which is of particular moment. I would say that the organisation of the sugar industry and its efforts for greater efficiency, and consequently its own welfare, are the admiration of other primary producers. Your mill suppliers' committees, your district executives, and your council give you many advantages. Your success is due to the spirit of co-operation which has existed between all sections and districts of your organisation. It is recognised that individualism would have wrecked your industry. I think you should strive to continue this feature. It must not be forgotten that the sugar agreement and the Commonwealth embargo are major items of policy. It is based on a "White Australia" principle and is intended to protect all engaged in the industry—farmers and workers alike. For that reason, therefore, any question affecting the industry must be looked at by all interests from the point of view of the complete unit, rather than from that of the individual sections.

Now, the position of the Government is quite clear. Apart altogether from our obligations under the sugar agreement, the Government at all times has fully recognised the difficulties of the position. The Government recognises that of the £8 per ton approximately received for export sugar, £3 12s. is due to British preference. The Government considers that you producers have a duty to Australia in return for the embargo—to produce and employ labour to the utmost of your ability consonant with discretion. This was one of the cogent arguments I used with Mr. Lyons in urging a renewal of the agreement last month. You must not ignore that obligation. But the Government, knowing all the facts, has not considered that you were in a position to compete on the world's market with unlimited production and yet secure prosperity for yourselves and decent wages and conditions for the workers. Control is spoken of in the South as some new thing, whilst actually, from time immemorial, control of production to the mill's efficient capacity and accessibility has been the order of the day. **The Government stands for prosperity for the man on the land, which will also secure to the wage-earner in rural industry adequate wages.** The Government recognises that with unlimited production and its corollary—a lower sugar price—there would be a claim for reduced wages and conditions. It astonishes me that many business people support a movement which must affect the district's prosperity, endanger the standard of living of the worker, and affect their solvency. As a matter of fact, I notice on your agenda a motion regarding the Federal Arbitration Court. I will not discuss the matter, except to say that this is indicative of what would happen if sensible control were not exercised in production, in the interests of the producers themselves, the workers in the industry, the business people in the local centre, and the public of Australia.

There is no more justification for a Federal award than there would be to hand Cane Prices Board legislation and administration over to the Commonwealth.

Cabbage Pests and their Control.

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

THE larvæ of the common cabbage moth occur wherever that vegetable is grown in Queensland, and successful production is rendered possible only by the regular application of insecticides. Two other species of caterpillars may also attack cabbages—namely, the centre grub, which, as its name implies, characteristically feeds in the growing centre of the plant rather than on the opened leaves; and the notorious corn ear worm, a much larger species, which has the habit of burrowing right into the heart of well-formed heads of cabbages. The larvæ of the common species are often referred to as green wrigglers, and as they are far commoner than the other two just mentioned, the moths to which these green wrigglers give rise are generally and rightly referred to as the cabbage moth. The life history, habits, and control of this species will now be discussed in some detail, briefer reference being made to the others in subsequent paragraphs, which will also include a discussion of the cabbage aphis.

Life History and Habits of the Cabbage Moth.*

The moth (Plate 137; figs. 9 and 10) is a small greyish-brown species with a rather pretty wing pattern, the wing spread being about two-thirds of an inch, and the body length slightly less than half an inch. If often occurs in enormous numbers in a cabbage patch, and is readily disturbed in walking among the plants, the moths darting about in short flights. It lays its oval yellow eggs (Plate 137; figs. 1 and 2), which are just visible to the naked eye, on the leaves of cabbages, cauliflowers, and a number of other vegetables, the eggs being laid singly or in pairs on the under surface of the leaves, generally in proximity to the larger leaf veins. After a brief incubation period the very small colourless caterpillars emerge and feed on the under surface of the leaf, the upper surface being left intact. However, as the green wrigglers grow they eat right through the leaf, which may eventually be riddled by numerous more or less circular holes. The larvæ (Plate 137; figs. 3-6) are slender, active green caterpillars, which are rather spindle-shaped and measure about half an inch in length when full grown. Their habit of falling with a jerking motion from the leaves when disturbed and hanging therefrom by a thin silken thread has earned for them the common designation of green wrigglers. The full-grown wrigglers pupate in lace-like cocoons (Plate 137; fig. 7) of great beauty, the pupæ (Plate 137; fig. 8), pale-green at first but later darkening to brown, being clearly visible through the open strands of the cocoons. At the end of the pupal period the moths emerge, and so another generation is initiated.

Control of the Cabbage Moth.

Spraying or dusting with insecticides is essential for the control of this pest, applications being made at frequent intervals—preferably every seven days—when the plants are in the field. As serious damage may be inflicted in the seed-beds, the seedlings should also be treated, and in their case the application should be made every second day. It is necessary to emphasise the fact that one or two applications are unlikely to be productive of any appreciable good; hence the cabbage-

* *Plutella maculipennis* Curt.

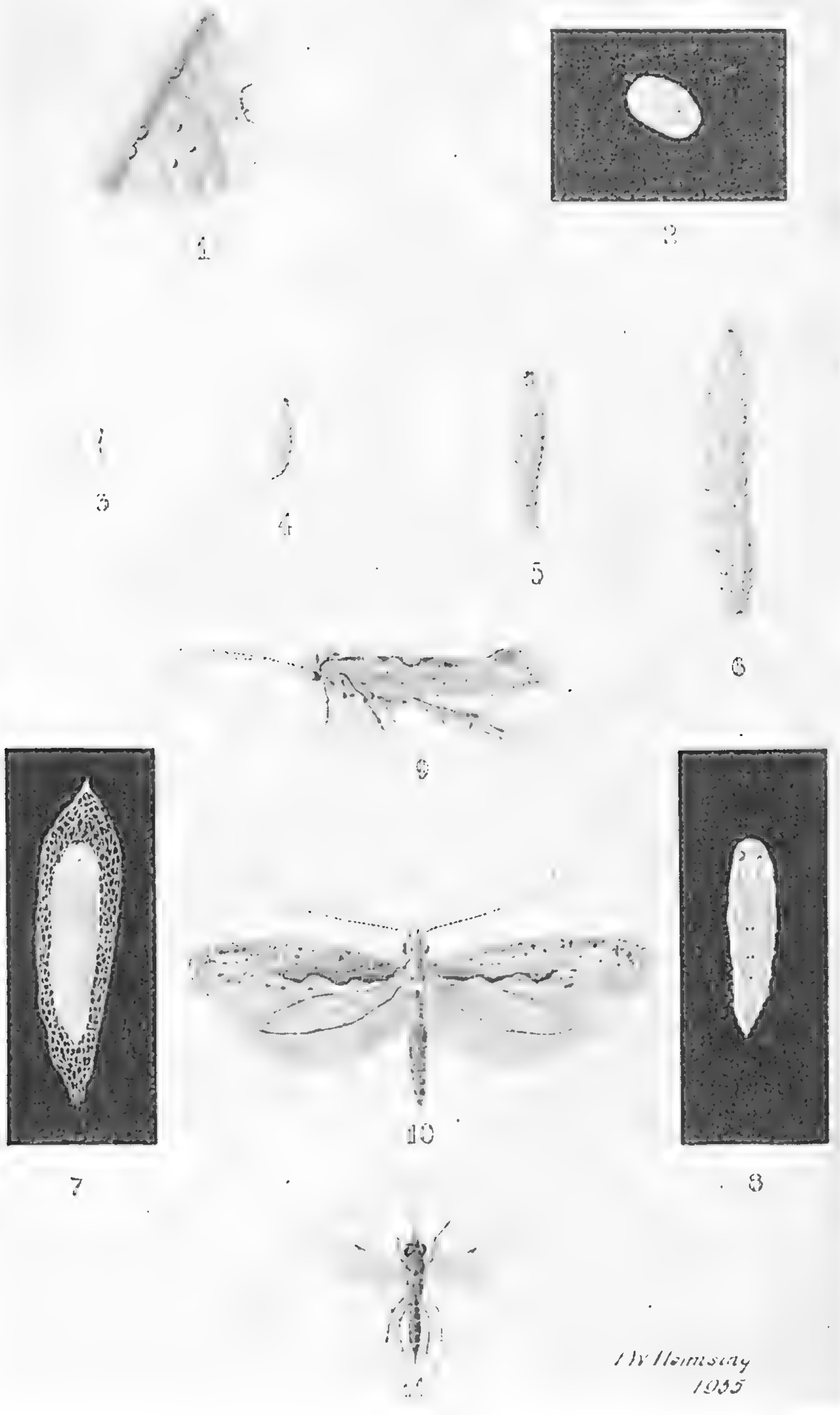

PLATE 137.

Fig. 1. Eggs *in situ* × 5.
Fig. 2. Egg × 24.
Fig. 3. 1st stage larva × 5.
Fig. 4. 2nd stage larva × 5.
Fig. 5. 3rd stage larva × 5.
Fig. 6. 4th stage larva × 5.
Fig. 7. Cocoon × 5.
Fig. 8. Pupa × 5.
Fig. 9. Adult (lateral view) × 5.
Fig. 10. Adult (dorsal view) × 5.
Fig. 11. Larval parasite × 4.

grower should include spraying or dusting as a regular routine in cabbage production. Furthermore, the spraying or dusting must be thoroughly done, the under sides of the leaves being as well coated as practicable.

Arsenate of lead was formerly largely employed for cabbage moth control, but this insecticide has rather fallen into disrepute, because injurious spray residues were all too frequently associated with cabbages marketed after spraying or dusting with this arsenical. However, numerous experiments have demonstrated that derris sprays give an even better control of cabbage moth caterpillars than arsenate of lead, and growers are accordingly advised to use a reliable brand of derris for the control of this serious pest. Derris dusts have also given promising results in preliminary trials, but they have not yet been so extensively tested as the derris sprays.

Some assistance in controlling cabbage moth may be obtained by strict attention to farm hygiene. The disposal of unmarketable cabbages and the residues of marketed cabbages may admittedly present difficulties, but, nevertheless, in so far as it is practicable to do so, this material should be destroyed, thereby eliminating considerable quantities of plant tissue on which the moth can breed. Finally, it may be pointed out that plantings should be restricted to areas to which efficient and regular attention can be given, and, so far as practicable, successive plantings should not be adjacent to each other.

Centre Grub.*

The cabbage moth is in evidence all the year round in Queensland, but the centre grub is primarily a pest of the summer months. It burrows into the growing centre of the plant and tunnels in the main stem, the young leaves of attacked plants being closely webbed together. When tunnelling of the stem takes place in a young plant it generally succumbs to the attack. At a later stage in growth, however, death does not ensue, for although the main growing bud may be destroyed side shoots appear, and if all but the best of these side shoots are immediately removed, a marketable cabbage may be produced. A further feature of this grub's feeding in severe infestations is tunnelling in large leaf veins in the older plants. These tunnels occur in leaves resting on the ground or in close proximity thereto, and soil particles and grass are often webbed together to complete the tunnel. The full-grown centre grub is a pale-yellow caterpillar, slightly more than half an inch in length, the colour pattern being elaborated by the presence of seven brownish longitudinal stripes. The grub pupates in its tunnel, and eventually the small pale, fragile, brown and grey coloured moth emerges. The measures outlined for the control of the cabbage moth will also be found effective against the centre grub.

Corn Ear Worm.†

The well-known corn ear worm may occasion considerable damage in cabbages, more particularly in late summer and autumn, its characteristic mode of attack being to tunnel towards the heart of the cabbage. With respect to its incidence in cabbages, the position is that no really satisfactory spray is available for dealing with this pest, although the derris used for cabbage moth and centre grub control may have a slight adverse influence on corn ear worm infestation.

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* *Ocbia undalis* Fabr. † *Heliothis obsoleta* Fabr.

Cabbage Aphis.*

The cabbage aphis is another common cabbage and cauliflower pest, very dense colonies of this insect being frequently found on both surfaces of the leaves, which become malformed and unsavoury in appearance. The young aphids are green in colour, but the older individuals in a colony are greyish-blue insects covered with a white waxy bloom. Like all aphids, this species is a soft-bodied slow-moving insect feeding by sucking the sap of the plant on which it lives, thereby greatly weakening its host, which becomes stunted and sickly, and may even succumb to the attack if the infestation is particularly heavy.

The experiments conducted to test and demonstrate the value of derris sprays for the control of the cabbage moth also showed that these insecticides are highly effective for the control of cabbage aphis; hence the spraying programme for dealing with the one pest should also more or less automatically control the other.

* *Brevicoryne brassicæ* L.

"PEG LEG" IN CATTLE.

Following is a brief summary of the chief points of a paper by Messrs. A. W. Turner, R. B. Kelley, and A. T. Dann on "peg leg" disease in cattle in North Queensland, and considered at the Science Congress in Melbourne in January:—

It was shown that when the Council for Scientific and Industrial Research in 1931 proposed investigations into cattle disease in North Queensland, one of the major problems urged by the United Graziers' Association was the investigation of that disease of cattle known colloquially as "peg leg." A suggestion had been made by officers of the State Department of Agriculture and Stock that it might be due to insufficiency of phosphorus in the soil and herbage, but proof was lacking. Investigations had revealed that the disease extended over about 13,000 square miles of country in two well-defined areas, one known as the Charters Towers, and the other as the Cloncurry area. The paper discussed the clinical symptoms, post-mortem signs, histology, and bio-chemistry, and the conclusion reached was that the disease was essentially an aphosphorosis, and that insufficiency of protein probably plays only a secondary role. There was thus a great similarity between "peg leg" and the South African disease styfsieckte; in both cases the bony lesions consisted of osteoporosis and osteomalacia. Analysis of soil and herbage had revealed a very low phosphorus content, which was reflected in a low content of inorganic phosphorus in the blood. In order to test (1) the phosphorus deficiency hypothesis, and (2) the effect of giving protein and other supplements to cattle grazing on a "peg-leg" property, a field station had been established on a property, Helenslea, in the Charters Towers area. As to experimental procedure during 1933, when statistically analysed, the controls showed an increase in weight of only 18.6 per cent. during the nine months of experiment, whereas animals receiving dicalcium phosphate showed 47.5 per cent. increase, and those receiving disodium phosphate dissolved in water increased 37.0 per cent. The experiments were partly repeated and extended this year, and were designed (1) to reveal the optimum dose of dicalcium phosphate, (2) to give information on the efficacy and palatability of various phosphatic and other licks, and (3) to investigate the value of the involuntary consumption of phosphorus, as disodium phosphate dissolved in the drinking water.

Prairie Grass Smut.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

OF recent years prairie grass crops have been seriously affected with smut. So widespread is this disease that all samples of seed examined are obviously contaminated with spores. On this account no grower should neglect to treat his seed before planting.

During the 1934 season the Department of Agriculture and Stock, as reported elsewhere in this issue, conducted experiments to test methods of seed treatment for the control of this disease. Highly satisfactory results were obtained by the use of the mercury dusts Abavit B and Ceresan and of a solution of formalin. Formalin is liable to impair the germination of the seed to some extent, and therefore one of the mercury dusts should be used if obtainable.

Mercury dusts should be applied at the rate of 3 oz. for every 20 lb. of prairie grass seed. The dust and seed should be thoroughly mixed by rotating together in a closed container such as is used for the treatment of wheat with copper carbonate.

Should the mercury dusts be unobtainable then the seed should be treated with formalin, as the advantages of the elimination of disease considerably outweigh the disadvantage due to the adverse effect on germination. This effect can be minimised by care in the treatment. The formalin solution should be made up by adding 1 pint of commercial (40 per cent.) formalin to 30 gallons of water. About a gallon is required for each bushel of seed to be treated. The seed should be spread out on a tight floor or tarpaulin and sprinkled with the solution, shoveled and sprinkled until it is all thoroughly moistened. The seed should then be covered with a tarpaulin or bags also moistened with the solution and left overnight. It should be sown the following day.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Report of Cereal Smut Experiments, 1934.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

DURING the season just concluded a number of experiments were laid down to test the efficiency of various seed treatments for the prevention of the smut diseases of cereals. The diseases worked with were bunt (*Tilletia foetans* and *T. caries*) of wheat also known as ball or covered smut, covered smut (*Ustilago hordei*) of barley, covered smut (*Ustilago levis*) and loose smut (*Ustilago avenae*) of oats, and prairie grass smut (*Ustilago bromivora*). In the case of wheat bunt well-established seed treatments are available to farmers for the control of the disease. The most suitable of these is the use of copper carbonate dust. Further trials with this disease were, however, warranted along two main lines. In conformity with other Australian States the relative efficiency of the different proprietary lines of copper carbonate was tested. A number of mercury dust treatments for which various advantages are claimed by their manufacturers were also tested.

No satisfactory method for the control of covered smut of barley was practised in Queensland prior to the series of experiments on this disease commenced in 1931. The 1934 trials were a continuation of the previous three seasons' work, and reliable seed treatments can be confidently recommended.

The increasing prevalence of the two smuts of oats and inquiries concerning its prevention indicated the desirability of gaining local experience in the effectiveness of various methods of seed treatment which have been advocated elsewhere.

Prairie grass smut has also been of considerable concern to growers, and as no definitely established control measures were known a number of representative seed treatments were tried out. The results obtained were striking, and there is no reason why growers of this crop should produce a smutted product.

The experimental plots were duplicated, one sowing being made at the Roma State Farm and the others on the property of Mr. F. W. Franke, senr., at Nobby. Results were obtained from all plots except the prairie grass at Nobby, which was lost owing to adverse conditions, and the wheat at Roma, in which no smut developed.

BUNT OF WHEAT.

Nobby.

Wheat seed (Pusa-Warren 3004) was artificially smutted by thoroughly mixing crushed bunt balls at the rate of approximately 1 part of bunt to 1,000 of wheat. Samples of the smutted seed were treated in various ways and drill sown in plots 2 chains long, each plot being two drill hoes wide. A space of 21 inches was left between plots. All treatments were replicated three times, except that using standard copper carbonate received from the Victorian Department of Agriculture, which was used as a check and planted every third plot. No exact germination counts were made, but it was reasonably uniform, excepting in the case of bluestone, where it was somewhat delayed, and formalin, which at the strength used destroyed the viability of most of the seed.

Details of Treatment.

Bluestone was used at the rate of $1\frac{1}{2}$ lb. in 10 gallons of water, the seed being immersed for three minutes, then drained and dried. In the

case of formalin the strength was 1 pint of commercial (40 per cent.) formalin to 30 gallons of water, and the time ten minutes. The seed was then covered overnight. Results indicated that this treatment was too severe, and should any grower wish to use formalin it should be sprinkled on the seed and only covered for a period of from two to four hours. Uspulun was used at a strength of 0·5 per cent., and the time of immersion was ten minutes, after which the seed was drained and dried. The dusts were applied at the rate of 2 oz. per bushel, with the exception of one treatment, in which standard copper carbonate was used at the rate of 1 oz. per bushel.

Results.

The number of plants per plot developing smut are given in Table I.

TABLE I.—SMUTTED PLANTS PER PLOT.

Treatment.	Block I.	Block II.	Block III.	Average.
Standard copper carbonate	1	3	1	1·7
Bluestone	5	5	4	4·7
Formalin	0	0	0	0
Standard copper carbonate	1	3	2	2
Uspulun	8	5	4	5·7
Tillantin R.	11	12	10	11
Standard copper carbonate	2	0	3	1·7
Abavit B.	0	1	0	0·3
Agrosan G.	31	18	2	17
Standard copper carbonate	3	0	2	1·7
Cooper's mercurial A.	0	0	..	0
Cooper's mercurial B.	2	2	..	2
Standard copper carbonate	7	0	0	2·3
Aero copper carbonate	14	8	0	7·3
Sickle copper carbonate	12	7	5	8
Standard copper carbonate	3	1	0	1·3
Antibunt	14	3	0	5·7
Untreated	199	225	177	200·7
Standard copper carbonate	3	1	0	1·3
Ceresan U.T., 1875	15	11	1	9
Standard copper carbonate, 1 oz.	18	20	1	13
Standard copper carbonate (Average of	all plots)	..	..	1·7

Smutted ears in the untreated plots averaged about 40 per cent. of the total. All treatments used reduced this heavy infection very considerably. The commercial copper carbonates reduced it to under 2 per cent., there being no definitely established difference between the brands tested. They were all, however, somewhat inferior to the Victorian standard copper carbonate. The mercurial compounds Tillantin R and Agrosan G were definitely inferior to the copper carbonates, Ceresan appeared to be slightly inferior, while Abavit B and the two dressings submitted by Messrs. William Cooper and Nephews (Aust.) Ltd. were definitely superior to the commercial brands of copper carbonate, and possibly also to the standard copper carbonate. In the absence of any results from the duplicate sowing at Roma, no great reliance should be placed on small differences between the treatments, and until further tests are carried out it is not considered desirable to recommend any change from the present general method of treating wheat seed with copper carbonate for the prevention of bunt.

COVERED SMUT OF BARLEY.

Nobby.

Barley seed carrying a heavy natural infection with smut was treated in various ways and drill-sown in plots uniformly with the wheat bunt plots alongside. Abavit B, 2 oz., was used every third plot as a check. No exact germination figures were obtained, but observations were made on the stand in the plots. At maturity a careful count was made of infected plants in each plot. With the exception of one of the formalin treatments, a reasonably uniform stand was obtained. The total number of smutted plants per plot is used as the basis of comparison between treatments, the divergence between this method and that using a true percentage infection being considered negligible.

Details of Treatment.

Three different methods of using formalin were tried. For the first, referred to as formalin ten minutes, the seed was immersed in a solution made up by adding 1 pint of formalin to 30 gallons of water. It was left in for ten minutes, then heaped and covered overnight with bags soaked in the solution, then sown next morning. The second, formalin one minute, was treated as the first except that the strength of the solution was 1 pint to 22 gallons and the time of immersion one minute. The treatment referred to as formalin sprinkle was made by turning and sprinkling the seed with formalin 1 pint to 30 gallons till it was thoroughly wetted. The seed was then covered overnight, as in the other treatments. The only other wet treatment was with Uspulun. In this case the seed was immersed in a 0·5 per cent. solution for ten minutes. It was then allowed to dry and planted the following day. The dry treatments were made by thoroughly mixing the seed and the dust in a closed container at the rate indicated—e.g., Abavit B 2 oz. represents a treatment at the rate of 2 oz. of Abavit B per bushel of barley.

Results.

The amount of smut which developed in the plots is shown in Table II.

Table II.—Smutted Plants per Plot.

Treatment.	Block I.	Block II.	Block III.	Average.
Abavit B., 2 oz.	3	2	1	2
Formalin, 10 mins.	0	0	0	0
Formalin, 1 min.	0	1	0	0·3
Abavit B., 2 oz.	6	0	4	3·3
Formalin sprinkle	0	0	0	0
Abavit B., 1½ oz.	15	15	11	13·7
Abavit B., 2 oz.	3	5	2	3·3
Ceresan U.T., 1875, 2 oz.	3	2	3	2·3
Ceresan U.T., 1875, 3 oz.	3	0	2	1·7
Abavit B., 2 oz.	2	5	10	5·7
Agrosan G., 2 oz.	7	22	16	15
Agrosan G., 3 oz.	7	10	15	10·7
Abavit B., 2 oz.	1	4	10	5
Cooper's A., 3 oz.	3	3	0	2
Cooper's B., 3 oz.	3	2	1	2
Abavit B., 2 oz.	7	3	5	5
Uspulun	8	2	6	5·3
Untreated	153	171	170	164·7
Average of all check plots	..	..	..	4

These results will be discussed in conjunction with those of the Roma plots.

Roma.

The experiment on covered smut of barley at Roma was conducted along similar lines to that at Nobby except that the plots were a little larger, being four rows wide and $1\frac{1}{2}$ chains long. Untreated seed was used for the check plots in place of seed treated with Abavit B. The results are set out in Table III.

TABLE III.—SMUTTED PLANTS PER PLOT.

Treatment.	Block I.	Block II.	Block III.	Average.
Untreated	45	45	33	41
Formalin, 10 mins.	0	0	0	0
Formalin, 1 min.	0	0	0	0
Untreated	30	48	57	41
Formalin sprinkle	0	1	0	0·3
Abavit B., 3 ozs.	0	0	0	0
Untreated	13	99	89	70·3
Ceresan U.T., 1875, 2 oz.	0	0	0	0
Ceresan U.T., 1875, 3 oz.	0	0	0	0
Untreated	53	39	12	34·7
Agrosan G., 2 oz.	0	1	1	0·7
Agrosan G., 3 oz.	0	0	1	0·3
Untreated	21	119	54	64·7
Cooper's A., 3 oz.	1	0	0	0·3
Cooper's B., 3 oz.	0	0	0	0
Untreated	55	29	50	44·7
Uspulun ..	6	4	8	6
Abavit B., 2 oz.	0	0	1	0·3
Average of all check plots	..	..	..	49·4

Conclusions.

Previous experiments had demonstrated the efficacy of formalin and Abavit B for the control of barley smut. The experiments under review demonstrated that of the various methods of applying formalin that known as the sprinkle is the best, as it gives very good control of the disease and less germination injury than results from other formalin treatments. Two dusts proved to be equal to or better than Abavit B, the first Ceresan, an organic mercury compound which is being placed on the Queensland market by Dalgety and Co., Ltd., and the second a mercury dust supplied for trial by Messrs. William Cooper and Nephews, but which is not available commercially. With regard to the rate of application of dust, the results do not warrant increasing the dose from 2 oz. per bushel to 3 oz. On the other hand, any lowering of the quantity below 2 oz. interferes seriously with the efficacy of the treatment.

OATS SMUT.

Nobby and Roma.

Algerian oats seed was artificially infected with a mixture of covered and loose smuts and subjected to various treatments. Ten treatments were applied and the seed sown in six blocks of eleven plots, each block containing one plot sown with infected untreated seed as well as one of each of the treatments. Duplicate sowings were made at Nobby and

Roma, the method of sowing and plot sizes being the same as for the wheat and barley smut experiments.

Details of Treatment.

Formalin was used at a strength of 1:240 (1 pint to 30 gallons), the seed being soaked for ten minutes, then covered overnight. Sublimatoform was made up by adding 1 part of corrosive sublimate and $2\frac{1}{2}$ parts of formalin to 1,000 parts of water. The seed was immersed for ten minutes, then dried. Corrosive sublimate was used at a strength of 1:1,000 with a similar period of immersion. In the case of bluestone the strength was $1\frac{1}{2}$ per cent., and the time of immersion three minutes, and for Uspulun 0·5 per cent. and ten minutes. The dusts Abavit B and Tillantin R, Ceresan, Agrosan G, and copper carbonate were used at the rate of 3 oz. per bushel.

Results.

Smut appeared in all the untreated plots when they came into ear. Both covered and loose smut were present, but no figures were obtained for their relative abundance nor for any differential effect that the treatments may have had on the two smuts. All that can be said is that in the case of those treatments for which no smut or only very few smutted plants developed then the treatment evidently had a controlling influence on both smuts.

The results are given below in Table IV. The figures represent the number of affected plants per plot, these numbers being used as the percentage infections were somewhat low and the total number of plants per plot did not appear to vary greatly.

Table IV.—Smutted Plants per Plot.

Treatment.	Roma.			Nobby.			Average.
	I.	II.	III.	I.	II.	III.	
Formalin	0	0	0	0	0	0	0
Sublimatoform	0	0	0	0	0	0	0
Corrosive sublimate	1	1	1	6	9	5	3·8
Bluestone	1	1	1	1	15	0	3·2
Abavit B.	0	0	0	2	1	0	0·5
Tillantin R.	7	3	6	4	10	11	6·8
Ceresan U.T., 1875	0	0	0	2	1	0	0·5
Agrosan G.	2	1	1	5	8	2	3·2
Uspulun	8	10	14	5	10	4	8·5
Copper carbonate	5	5	7	13	11	2	7·2
Untreated	37	31	41	28	26	29	32·0

All treatments reduced the incidence of smut, but Tillantin R, Uspulun, and copper carbonate were definitely unsatisfactory as compared with the better treatments. Corrosive sublimate on its own is inferior to a mixture with formalin or to formalin alone, and has nothing to commend it. Bluestone and Agrosan G appear to be somewhat poorer than formalin, sublimatoform, Abavit B, and Ceresan, but will probably be included in further trials to check this difference. In the meantime it is not necessary to alter the Department's previous recommendation of the use of formalin seed treatment for the control of oats smut excepting to add that the mercury dusts Abavit B or Ceresan may be used if available.

PRAIRIE GRASS SMUT.

Roma.

Prairie grass seed artificially infected with smut was subjected to seven treatments (including untreated) and planted uniformly with the wheat plots. Three blocks each containing one plot of each treatment and one untreated were sown.

Details of Treatment.

Formalin was used at a strength of 1 part in 240 of water, the seed being immersed for ten minutes. The bluestone solution was 1½ per cent. and the time of immersion three minutes. The corresponding figures for Upsulun were ½ per cent. and ten minutes. The dusts Abavit B, Ceresan, and Agrosan G were applied at the rate of 3 oz. per 20 lb. of seed. A fair stand was obtained and a count of mature plants per plot showed more survivals in the treated than in the untreated plots. In the case of the mercury dusts this difference appears significant, and probably is so even after allowing for possible variations in sowing rate due to differences of treatment. The seed following dry treatment or no treatment ran through the drill at an obviously faster rate than the wet-treated, which was swollen and still somewhat moist at the time of sowing.

Results.

The plants per plot surviving to maturity and the smut infection in each plot is given in Table V.

TABLE V.—PRAIRIE GRASS SMUT.

Treatment.	Block I.			Block II.			Block III.			Average.	
	Total Plants.	Smutted Plants.	Per cent. Smutted.	Total Plants.	Smutted Plants.	Per cent. Smutted.	Total Plants.	Smutted Plants.	Per cent. Smutted.	Total Plants.	Per cent. Smutted.
Ceresan U.T., 1875 ..	180	0	0	260	0	0	225	0	0	220	0
Formalin	121	0	0	179	1	0·6	154	0	0	151	0·2
Abavit B.	259	0	0	208	1	0·5	248	0	0	238	0·1
Agrosan G.	157	8	5	225	31	14	147	17	12	176	10·5
Bluestone	171	93	54	159	72	45	129	44	34	153	43·4
Uspulun..	128	65	51	183	110	60	146	83	57	152	56·6
Untreated	136	115	85	76	63	83	151	125	85	121	83·5

The mercury dusts Abavit B and Ceresan gave excellent control of the disease, as also did formalin, though it would appear that the germination had been affected by the formalin treatment. Probably a sprinkle method of formalin treatment would be more satisfactory. The results with Agrosan G were inferior to those with the other two mercury dusts. Bluestone and Uspulun dips were quite unsatisfactory.

STOPPING RAT HOLES.

Soak old newspapers in a strong solution of soda and hot water and squeeze it to a pulp. This will set like cement, and rats and mice will not eat it.

An Introduction to Beekeeping.

By HENRY HACKER, F.R.E.S., Entomologist.

THE feeling that there is room for expansion in Queensland beekeeping has been reflected by the numerous inquiries addressed to the Department of Agriculture and Stock during the last year or two, many of these being from persons possessing little or no experience of the subject.

This article has accordingly been compiled in order to meet the demand for information, and provides the prospective beekeeper with a concise account of those phases of the industry regarding which most of the inquiries have been received, such as the names and uses of the essential articles of apiary equipment, or the methods of commencing an apiary and handling the bees.

A portion of the matter contained herein has been previously published in the form of leaflets issued by the Department, but by far the greater part of the text has been specially written for this article.

As it is not possible within the limited space available to give minute details on many of the manipulations, technique, and so on, these notes may be considered as introductory, and when some experience has been acquired the beginner should consult one of the larger text-books on the subject, wherein he will find more detailed information to augment that which is given here.

All the methods recommended have been tested by leading beekeepers in this State, and have been found suitable for Queensland conditions. The reader who wishes to keep bees may therefore proceed with confidence in the knowledge that he is following proved methods which will greatly enhance his ultimate prospects of success.

SECTION I.—THE HONEY BEE.*

Introduction of Honey Bees to Australia.

The first reference to bees in Australian records occurs in a letter from Gregory Blaxland dated 1st March, 1805, asking for cargo space on the "William Pitt" for a "swarm of bees in cabin with wire cage over the hive." There is, however, no record of their safe landing. The first record of the actual introduction of bees occurs in a letter from Samuel Marsden to the secretary of the London Missionary Society, in which he mentions that on his way back to the colony in the ship "Ann" he purchased at Rio de Janeiro two hives, which were safely landed on 27th February, 1810, and placed in the garden of Government House in Sydney.

In March, 1822, Captain Wallace, of the "Isabella," brought in a number of hives, and the first swarming is recorded as taking place in the following October. These black or English bees have since spread over the entire continent, and are now locally known as the bush bee. The Italian race, *A. mellifera* var. *ligustica*, was introduced between the years 1874 and 1878, and the so-called hybrid is a cross between the black and the Italian races. The Italians, and even the hybrids, have shown themselves so far superior to the black bees as honey-makers that the great majority of beekeepers consider all discussion as to their

* *Apis mellifera* Linn., 1758 (=*mellifica* L. 1767).

respective merits to be at an end. Italians, where the race is still pure and not enfeebled by interbreeding with light-coloured bees, are superior to any other kind, and may be safely recommended to those who propose to keep bees, either as a commercial proposition or merely as a hobby.

Adaptability of the Honey Bee.

Honey bees occur in every country throughout the world which possesses a flora sufficiently varied for their needs. They have also adapted themselves to every kind of climate ranging from the tropics to near the Arctic Circle. The success of the honey bees as colonists under such varying conditions is due to their habit of storing large quantities of honey, and also to their ability to generate heat from their food and thus maintain a rather high temperature in the hive during periods of cold weather, and conversely to reduce it when necessary by fanning with their wings, thus keeping an even temperature within, irrespective of the conditions prevailing outside.

Sense of Smell.

Bees also possess a highly developed sense of smell, which is of the greatest importance to them in their various activities, and a number of distinct odours are present in the hive, such as the colony odour, the individual odour, the brood odour, the wax odour, and the honey odour. The hive odour is composed of a mixture of these, and every member of a colony, besides its individual odour, carries the hive odour which is the chief means of mutual recognition between bees belonging to the same colony.

An appreciation of the part that odours play in the behaviour of bees is of considerable importance to beekeepers, because the introduction of queens, uniting colonies, and various other manipulations may all be performed more successfully in the light of such knowledge.

The Comb.

Bee comb consists of six-sided wax cells, sloping slightly upward from the base to the mouth, a midrib of wax forming the base of the cells on both sides of the comb. The worker cells measure about one-fifth of an inch, and the drone cells about a-quarter of an inch between their parallel sides. Honey and pollen are stored in worker and drone cells. Other cells, called queen cells, are sometimes present in a hive when the bees desire to rear a fresh queen. These cells are much larger than worker or drone cells, more or less pitted on the surface, about an inch long, and are usually attached to the outer edges of the comb.

The Brood.

The eggs, larvæ or grubs, pupæ, and the young bees before they emerge from the cells in which the eggs were laid are called the brood. The eggs are minute banana-shaped objects, which are attached by one end to the base of the cell. They hatch after an incubation period of three days and the bee larvæ then appear. At first the young larvæ are curled round at the bottom of their cells, but when they have nearly completed their feeding period they are stretched out to their full length with their heads towards the mouth of the cells. At this stage the larvæ receive their last meal, and the bees begin to seal the cells with a thin cap of porous wax and pollen, through which the larvæ are able to breathe. Occasionally there are exceptions when the cells are left unsealed, although the cell walls are slightly extended and the opening

contracted. This condition is called bareheaded brood by beekeepers, and its occurrence is of no consequence, for the bees develop within just the same as if the cells were sealed.

After the cells are sealed the larvæ line the interior with a delicate silken cocoon, and then change into pupæ, which at first are white but gradually become darker, until the metamorphosis is complete about the nineteenth day after hatching; the young bees then shed their pupal skin and gnaw their way out of the cells.

Worker Bees.

The worker bees are responsible for all the work of the hive, the various duties being carried out by bees of different ages. The life of the worker may thus be divided into three periods.

First Period.—The newly-emerged bees clean out and polish cells for the reception of the eggs, and also help in maintaining the right temperature of the hive. After the second day, feeding of the older larvæ with honey and pollen is taken over, and this goes on until the sixth day. From the sixth until about the fifteenth day the brood food glands are functionally active, and the bees of this age consequently devote themselves to feeding the very young larvæ. By the end of this time these glands tend to atrophy, and brood-feeding by these particular bees ceases.

Second Period.—This is begun with their first flight from the hive, and for short periods in the middle of the day they may be seen flying in ever-widening circles around their hive while orienting themselves—that is, memorising their home or the place where it stands. Each day their flight is extended until they have learned the landmarks for a considerable distance around. During this period the bees also receive and store nectar from the foraging bees; they attend to the pollen brought in and act as general workers in the hive. Bees of this age have their wax glands in the active secretory phase. Towards the close of this period, which lasts about ten days, the bees take on the duty of guarding the hive entrance.

Third Period.—In this period, which is from twenty to thirty days' duration during the summer months, the workers are active only in the field, and are engaged in foraging for water, pollen, and nectar. They continue this work until the end of their normal life of a few weeks; sometimes it is very much less, as strong winds, cold showers, insectivorous birds, and insect enemies all take a constant and heavy toll of the field bees.

Drones.

The male bees or drones do not perform any duties within the hive, and are not even able to feed themselves, but depend upon the workers to give them food. Their one function in life is to mate with the virgin queen when on her mating flight. For this purpose they are supported in some numbers by prosperous colonies during the summer months, but at the end of the season the behaviour of the workers towards them undergoes a change. One day they leave as usual for their daily flight, but are prevented by the workers from re-entering the hive, with the result that they quickly succumb to hunger and cold. They may be readily distinguished from the workers by their greater size, their large eyes, and the absence of a sting.

Queen Bees.

The queen bee is the most important member of the hive, for upon her fecundity depends the prosperity of the colony. When the queen's eggs are fertilized they develop into workers or queens according to the way the larvæ are fed, but when unfertilized, into males or drones, as is also the case with the eggs that are sometimes laid by workers.

The fertilized queen bee is somewhat similar to the worker-bee, but her reproductive organs are much more developed. She may, however, be easily separated from the other bees in the colony by her length, which is about one and a-half times that of the worker. Her wings do not extend to the end of the abdomen, which is long and tapering, and she differs from the workers in several other respects; she has no pollen-gathering apparatus, and her sting is not barbed like that of the worker-bee, but is somewhat curved and is chiefly used as an ovipositor, although she also uses it in destroying a rival. She varies from a golden to a brown colour, and as she grows older the colour darkens.

The queen goes out on her mating flight, as a rule, within the first five or seven days after she has emerged from her cell. She leaves the hive and mates with a drone high in the air, and after a successful flight she returns with the organs of the drone remaining attached to her body. She quietly enters the hive, and on the following day she will generally commence to deposit the enormous number of eggs necessary for the production of the young bees, which are continually required to keep the colony in a prosperous condition.

The number of eggs laid by a queen varies from time to time, being regulated by the requirements of the colony, or the space available. During the period of maximum activity in the early summer the queen will lay as many as 2,000 eggs within twenty-four hours. The average life of a queen is about three years, and she reaches the peak of her egg-laying capacity in the first season, after which she deteriorates. From this time on the colony will gradually diminish in numbers until she is replaced by a young queen.

SECTION II.—PRODUCTS OF THE HIVE.

Honey.

Nectar is the raw material from which the bees manufacture honey, and consists chiefly of a solution of sugars with small amounts of other materials, including colouring matter, and those ingredients which give to honeys their characteristic flavours.

The field bee derives its supplies from the successive blooms of a great variety of trees, shrubs, and other cultivated and wild plants, of which those belonging to the order *Myrtaceæ,* which include the Eucalypts, are by far the most important in this State

When first gathered, nectar is a thin, watery liquid possessing a raw, rank taste, and one of the functions of the worker bee is to transform this raw product into the wholesome and delicious food which honey constitutes.

There have been two theories offered to explain how the honey bee reduces the high water content of nectar to the low water content of honey; these are known as the excretion and the evaporation theories. The first of these is based largely upon the well-known observation that bees carrying nectar often eject a tiny spray of colourless liquid. This was assumed by some of the earlier observers to be the result of a process

within the body of the bee, whereby some of the excess water was eliminated from the nectar while the bee was carrying it to the hive. Largely as a result of recent experiments in the United States of America it is now known that the evaporation theory is the correct one, the evaporation of nectar being carried out within the hive. The nectar-carrying bee, upon her return from the field, delivers her load to one or more house-bees, which then put the nectar through a process of kneading with their mouth-parts, which apparently reduces its water content and probably permits the addition of enzymes, such as invertase, which are produced by the salivary glands. It was also observed that instead of depositing the entire load in a single cell, the house-bee often distributes it by attaching a small hanging drop to the roof of each of several cells; these small hanging drops present relatively large surfaces, from which moisture can evaporate rapidly. Later the droplets are collected, and it is assumed that they are again put through the process of manipulation by the mouth-parts.

The evaporation of the nectar is carried to a further stage by worker-bees, which station themselves in line near the hive entrance. These, by the continual buzzing of their wings, drive currents of air into and out of the hive and over the comb surfaces. If the hand is held before the entrance at such a time a strong current of warm air may be felt coming out. The loud buzzing heard at night during the summer time is due to the wings of workers engaged chiefly in ripening nectar. When finally this process is completed, it is found that the water content has been reduced to about 15 to 20 per cent., and that the disagreeable odours and flavours, probably due to volatile oils, have also been driven off. The finished product is stored in cells above and around the brood nest and the main cluster of bees. The work of sealing with waxen caps then goes forward rapidly, the covering being more or less porous. This sealing of the cells indicates to the beekeeper that the honey is ripe and in the right condition for extraction.

Ordinarily, honey is judged by its colour, flavour, and density. The very great range in its colour is due entirely to the sources from which it is obtained. The colour varies from almost white, through straw and amber to reddish. It has been known to be blood-red, and again to have a greenish tinge, and still be absolutely pure. The aroma and flavour of the honey also varies very considerably. White clover and lucerne honeys are generally admitted to a preference as to appearance and flavour, although many people who are used to the more strongly flavoured eucalyptus honeys consider the former to be rather insipid. It must be noted, however, that lightness of colour alone is no conclusive evidence of superior quality, and honey of the darker colours, as well as honey of the lighter colours, may be of the higher grades and quite suitable for table use. Some of the most prized honeys—as, for instance, that gathered from orange blossoms—is of a very deep colour, while the famous heather honey of Europe is quite dark, and yet no honey stands higher in popular esteem on that continent.

Honey is marketed in three principal forms—extracted or liquid honey, which has been separated from the uncrushed comb by centrifugal force or gravity; comb honey contained in the cells of comb, usually in 1-lb. sections; chunk honey, which is sometimes retailed here, in which comb is cut into rectangular pieces and placed in the container with the liquid honey, which, if packed in glass, increases the attractiveness of its appearance.

Most of the honey is marketed in the extracted form. Bees are ordinarily able to produce a larger quantity of honey if they are not compelled to build comb for it, and by emptying the combs and replacing them in the hive the bee is able in periods of heavy nectar secretion to proceed immediately to the storage of more honey.

The production of comb honey requires much greater skill and experience on the part of the beekeeper, and can only be carried out successfully in limited areas where the conditions are favourable. It should not be attempted in localities where the honey flow is slow or intermittent, where the character of the honey flow is such that it granulates quickly in the comb while it is on the market, or where the honey is dark in colour. Local market conditions in some instances may, of course, be such as to make it seem advisable to produce comb honey in limited quantities in a locality that is not well suited to comb-honey production, but the beekeeper who expects to produce comb honey for the general market should first be sure that his is a comb-honey locality.

Almost all honeys granulate or candy after a certain time. Those which are high in dextrose or grape sugar will granulate very quickly after being exposed to the air by extraction. Granulation is hastened during periods when there is the greatest difference between day and night temperature. Conversely, the liquid condition may be maintained best by exposure to moderate heat; for instance, a honey which ordinarily granulates quickly may remain liquid for years if stored under a roof exposed to the sun. For this reason storekeepers commonly keep their stocks on the warmer top shelves of their stores.

Beeswax.

Beeswax is secreted by special glands in honey-bees of a certain age, these glands being situated on the ventral surface of the abdomen. A reasonably high temperature and a honey flow are necessary for its production. If the bees are closely watched under these conditions, little pearly discs of wax somewhat resembling fish scales will be seen protruding from between the segments on the underside of the abdomen. These wax scales are scraped off with the spines of one hind leg, then pushed forward and grasped by the front legs and transferred to the mandibles, where they are manipulated or masticated, after which they are applied to the comb. During the process the bee stands on three legs, the two intermediate legs and one hind leg not in action, while the other hind leg and the two fore legs, in connection with the mandibles, perform the manipulations. Each individual bee removes its own wax scales without any assistance.

At the time a swarm is hived there is no wax in the hive under natural conditions. The wax secretions, however, become very active, and in an extremely short time the hive is supplied with combs. It is also true, of course, that wax is secreted at any time during the active season, when it is necessary that more combs be built to accommodate brood or stores, provided, of course, that there is room. If a comb is removed from the centre of the brood chamber or from the super, it is replaced as needed, but, as a rule, not so rapidly as in the case of a newly-hived swarm. The rapidity of the honey flow influences this wax secretion greatly.

Notwithstanding the fact that wax is a more valuable article than honey, it pays the beekeeper of to-day to produce honey in preference to making the bees expend their energies in the production of wax.

With modern methods of extraction the honey is removed from the combs, and these are again given to the bees or carefully stored away for use during the following season. The wax which the beekeeper now obtains results from the melting-up of cappings, old combs, or combs exhibiting faults, such as stretched cells, or those having too great a proportion of drone cells.

Beeswax has many uses, both in the arts and in commerce, and fresh uses are continually being found for this product. A very satisfactory floor finish can be made by melting 1 lb. of beeswax, and while it is cooling stirring into it some turpentine, the proportion varying according to whether the mixture is required to be thin or thick. Certain grades of blacking, harness oils, and lubricants require pure beeswax in their manufacture. Large quantities of beeswax in the form of candles are used in churches. The electrical supply business is a large consumer, for the windings of the electric wires are soaked in beeswax to prevent their being affected by extremes of heat or moisture. Even the dental profession consumes large quantities every year to take impressions in the mouth. Last, but not least, the beekeeper himself is a large consumer as well as a producer of wax.

Pollen.

Pollen is the reproductive substance of flowers, which is transferred from the male to the female portion of the flower, or from the male flower to the female flower for the reproduction of the species. Nature has provided various methods for this transfer. Amongst these are flying insects, of which bees are the principal. Pollen is highly nitrogenous and contains vitamins necessary for the development of the bee brood. Nature is always prolific, and provides more than is necessary for reproductive purposes. Bees, as they visit flower after flower, carry the pollen from the anthers and fertilize the styles. In doing this they take a toll for their service, and carry some of the surplus pollen away to their hives to make food for their young larvæ. When breeding is taking place, the nurse bees convert honey and pollen into chyle food, which is deposited in the larval cells. Pollen is generally yellow or orange in colour, but it may be other colours, such as white, green, or blue, according to the source from which it is obtained.

Pollen may be collected by the worker-bee upon its mouth-parts, upon the brushes of its legs, and upon the hairy surface of its body. When the bee collects from small flowers, or when the supply is not abundant, the mouth-parts are chiefly used for gathering it. The specialised brushes on the legs are used to remove the pollen grains from the body and transport it to the pollen baskets on the hind legs.

The pollen grains are slightly moistened with honey to make them cohesive, and after the load has been carried to the hive it is deposited by the bee within one of the cells of the comb. It is then packed in the cell by some other worker, whose duty it is to flatten out the rounded masses and add more fluid to them.

Propolis.

Propolis is known to every beekeeper under its commercial name of bee glue. Its source has been questioned recently, but it is generally supposed to be collected by the bees from the waxy bud scales and other parts of various trees. In any case, the bees bring it in from the field in much the same manner as pollen. Their uses for it are many; with it the frames are cemented in place, the covers and bottom boards are

glued fast to the hive body, the hive entrance is contracted, and cracks are stopped against cold draughts and robber bees. During a recent inspection tour, mounds of propolis were seen on the floor of several hives, and a further examination showed a dried mouse under each mound. The mice had evidently crept into the hives and had been stung to death by the bees, but finding that the bodies were too heavy to drag out, the bees had sealed them to the floor of the hive with a thick coating of propolis. Because it liberates a very pleasant odour while burning, it sometimes serves as a sort of incense, especially for church rites. Much propolis is said to be used in Europe and elsewhere for this purpose, but there is no market for the substance in Queensland.

SECTION III.—APIARY EQUIPMENT.

The Hive.

A hive, in order to meet the requirements of the Apiaries Act, must contain moveable frames which may easily be lifted out for inspection. A properly constructed frame hive also embodies the important feature of a bee-space. This is usually regarded as a quarter of an inch separating the various portions of the hive. Father Langstroth made the discovery that bees recognise and protect passageways which are now called bee-spaces. All who preceded him failed to grasp the fact that bees would leave such spaces unfilled with wax or propolis. Before Langstroth's time it was necessary to pull out frames stuck fast to the hives with propolis, or tear or cut loose the combs with a thin-bladed knife before they could be removed for the purpose of inspection. Modern hives are designed with a bee-space of one-quarter of an inch surrounding the frames on every side, and although they may be of different sizes to accommodate a varying number of frames, they all possess this feature of a bee-space.

When the size of the hive to be used is decided upon, that size should be strictly adhered to, as uniformity in this respect will save much trouble and loss of time when manipulating the colonies. As the great majority of the hives used in Queensland at the present time consist of the ten-frame Langstroth hive, that size may be considered standard here, as it is in the United States. The measurements given below apply to hives of this size.

The modern Langstroth hive (Plate 138) consists of the following parts:—A floor or bottom board; a brood chamber or hive body in which ten brood frames hang from metal rabbets near the top; a super or honey chamber, which is identical in measurements to the brood chamber, in which the field bees store honey; a thin covering known as the inner cover, and, in addition, a telescopic cover with a metal roof, which is added to give the bees extra protection from weather conditions.

The hive body is a box without top or bottom. The dimensions are $19\frac{1}{8}$ inches by $15\frac{1}{8}$ inches inside measurements, the height being $9\frac{1}{2}$ inches, and it is made of $\frac{7}{8}$-inch timber. The joints of the body are dovetailed, which makes it exceptionally strong. Metal rabbets for suspending the frames are preferable to wooden rabbets, because the frames slide easily along them, and the bees are less likely to glue the frames to the metal.

The bottom board or floor is a plain board 22 inches long by 16 inches wide by $\frac{7}{8}$-inch thick. Fastened to the upper surface of the board are three slats $\frac{7}{8}$-inch wide by $\frac{1}{4}$-inch thick, the slats being otherwise of the same dimensions as the hive body. This arrangement leaves an

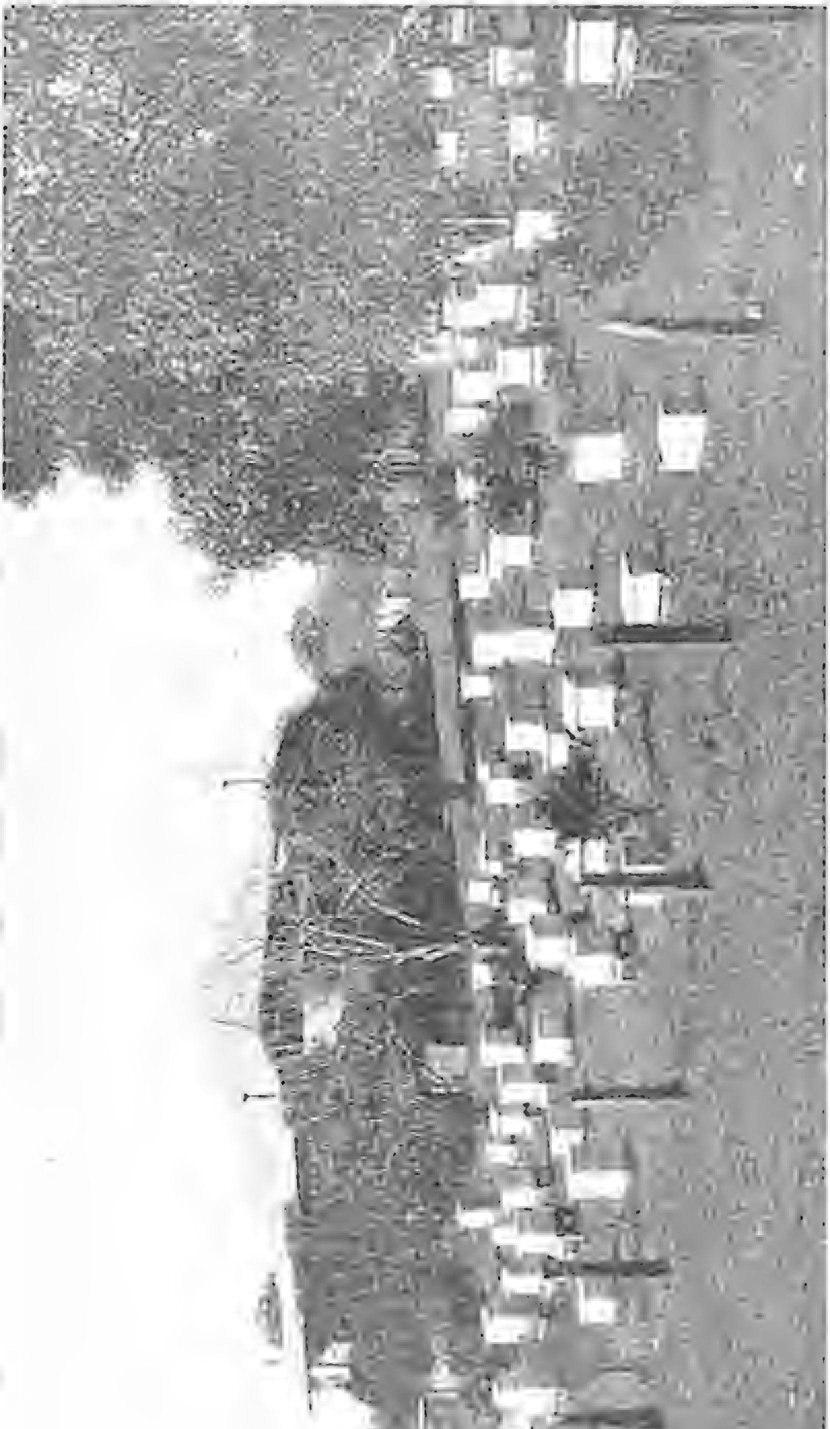


PLATE 138.—A WELL-CARED-FOR APIARY.

entrance at the front $\frac{1}{4}$-inch deep, this entrance extending the full width of the hive.

A hive cover should keep the inside of the hive dry and prevent the extremes of heat and cold affecting the bees from the top. The pattern which seems to meet those requirements best is a flat cover telescoping over the top of the hive body and extending down the sides of the hive for $2\frac{3}{4}$ inches. This cover consists of a rim of $\frac{7}{8}$-inch wood, to which $\frac{3}{8}$ or $\frac{1}{2}$-inch boards are nailed, which in turn are covered by galvanised iron turned down over and nailed to the side of the rim. The rim should be $\frac{1}{4}$ inch longer and a $\frac{1}{4}$ inch wider inside than the outside of the hive. Layers of paper are placed between the boards and the galvanised iron of the cover to act as insulating material.

With this type of hive cover it will be advisable to use an inner or super cover board, which is an inner cover made of thin boards fastened to a frame the full size of the hive body, although a sheet of three-ply will serve the same purpose. If no inner cover is used the bees will glue the cover to the frames with propolis, making it difficult to remove, while the jarring caused by levering off a stuck cover angers the bees and incites them to sting. The wide-spread practice of placing a hessian bag between the frames and cover is not recommended, because it fills the bee-space and forms a safe hiding place for wax-moths, ants, and cockroaches, as the bees cannot enter the small spaces to clean them out. Furthermore, bags or pieces of hessian absorb water and conduct it into the hive at the edges, sometimes causing warping of the hive walls as well as mouldy combs.

The frames (Plate 139, fig. 3) are suspended inside the hive bodies, so that there is $\frac{1}{4}$-inch bee-space between the top of the frames and the cover. A similar bee-space is provided at the ends by making the frames $\frac{3}{4}$ inch shorter than the inside length of the hive.

Many different patterns of frames are in use, those known as self-spacing—that is, provided with projections at the sides to preserve the bee-space between each frame—being the most useful. Although any person who is handy with tools can make serviceable hive bodies, covers, and bottom boards, home-made frames are not recommended, as the machine-made frames are turned out more cheaply and much more accurately than they could be produced by hand.

Painting all hives before use protects them from weather and greatly lengthens their life. White paint is usually desirable, because it helps to prevent excessive heat in the colony during hot weather. It is also recommended that the ends of all hive-boards receive a coat of raw linseed oil before nailing together, as this will prevent timber decay, which will attack the ends of boards more quickly than the sides.

A queen excluder (Plate 144, fig. 6) is a sheet of zinc with perforations of a definite size, large enough to permit the passage of the workers, but too small to allow the passage of the queen. It is placed on top of the brood-body, with the result that the queen is prevented from travelling into the super or upper story to deposit her eggs, from which brood would be produced. It should be stated, however, that there is some diversity of opinion among the beekeepers with regard to the use of a queen excluder. Those against its use maintain that it prevents the free passage of the bees into the super and hinders the proper ventilation of the hive, with the result that the activity of the bees is lessened and many bees are employed in ventilating the hive when they might be gathering

Plate 139.

Fig. 1. Embedder.
Fig. 2. Sheet of foundation.
Fig. 3. Wired frame.
Fig. 4. Reel of wire.

honey. Until the beginner is adept in the manipulation of his bees and acquires a good knowledge of their habits, it is advisable for him to use the queen excluder; he can discard it later if thought advisable.

Comb Foundation.

Comb foundation (Plate 139, fig. 2) is just what its name signifies, being the base, midrib, or foundation of honeycomb. If a piece of comb be taken and sliced down on both sides nearly to the bottom of the cells, all that is left is the foundation of the comb, hence the name. In commercial beekeeping, ready-made foundation comb is prepared by passing a thin sheet of pure beeswax between a set of rollers, the surfaces of which have been stamped or engraved in such a way as to give the imprint of the natural base of the honeycomb itself. Bees will utilise this man-made article and construct it into perfect all-worker comb within two or three days during a good honey flow. The advantages of using full sheets of foundation in the frames instead of allowing the bees to build comb in their own way are—firstly, a stronger force of worker bees and very few drones will be produced; secondly, faster building of the combs for brood and the storage of honey is ensured; and, thirdly, stronger and straighter comb is built.

Some beekeepers use only narrow strips of foundation comb known as starters. These, however, are not recommended, because they are not of much help, as the bees will still have to make a large amount of wax. The resulting comb will also contain a large proportion of drone cells, which is not desirable.

Each frame, after being nailed together, should have four small holes drilled through the middle of both sides at an equal distance apart. A single piece of fine wire (Plate 139, fig. 4) is fastened to a tack driven almost in close to the first hole, and is then threaded through the eight holes in such a manner that four horizontal wires stretch across the frame. The wire should be pulled tight and kept taut by winding the loose end round the head of a second tack driven in close to the last hole. Then turn the wired frame upside down and fit the sheet of foundation in with its edge close to the top bar. A vessel of hot wax and a teaspoon should be close at hand. Next tilt the frame and pour a little hot wax along the angle formed by the top bar and the foundation comb. The wax, when set, will firmly cement the sheet to the top bar. Special implements have been devised for this purpose, but a teaspoon is always at hand and is convenient for pouring the melted wax. The sheet of foundation is fastened to the wires with a tool called an embedder (Plate 139, fig. 1), which consists of a small serrated wheel on a handle, the wheel being run along the wires, thus pressing them into the wax. If the sheet of foundation is fastened into a frame in a cool temperature it will certainly buckle and warp out of shape when placed in the warm interior of a hive. To ensure nice, regular comb being built, foundation work should therefore be performed in a heated room.

The Honey House.

A few remarks are necessary on the honey-house, or the place where the honey is extracted. It should be so arranged that no bees can enter it when attracted by the odour of the honey. The window apertures should be covered with a piece of gauze, which is continued for about 6 inches above the top of the window, on the outside, and ¼ inch from the wall. Bees almost always crawl upward, and those stragglers which

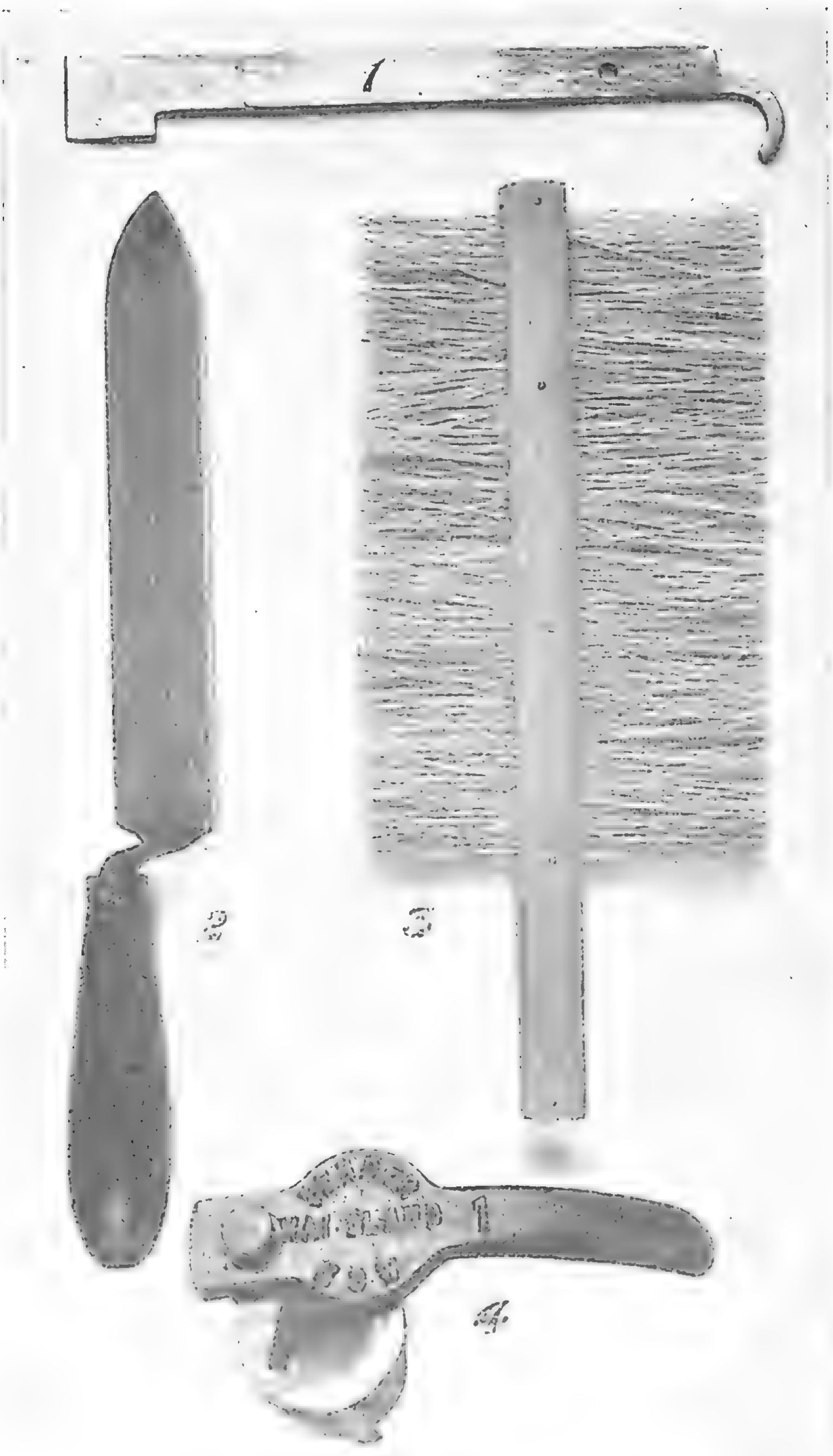


PLATE 140.

Fig. 1. Hive tool.
Fig. 2. Uncapping knife.
Fig. 3. Bee brush.
Fig. 4. Honey gate.

have gained access to the honey-room on combs, &c., will crawl up the wire gauze and out of the opening, but other bees will not try to get in that way. That the extracting room be bee-tight is practically the only absolute requirement. Honey should never be extracted in the open air, except during a heavy honey flow, when bees are not inclined to rob.

For the construction of the honey-house, hardwood and galvanised iron is recommended, and if the apiary is on sloping ground the building should be placed at the lowest corner. A barrow full of honeycomb ready for extraction is of considerable weight, and it saves labour to use a down grade. A great deal of heavy lifting is saved inside the honey-house by using the gravitation system. The cappings melter and extractor should be placed on a platform raised several feet above the floor, high enough to allow the honey to run into a tank placed on the floor. A well is dug below the gate of the tank sufficiently deep to accommodate the 60-lb. tins used when filling from the tank.

Further ideas for the improvement of the honey-house will doubtless occur to the progressive beekeeper. A cement floor on a gentle slope ensures freedom from dust and facilitates cleaning. A wooden runway on which to slide the supers of comb through a hanging door covered with wire gauze saves much lifting and prevents the entrance of many bees. If room permits, a workshop with a carpenter's bench built at one end of the honey-house makes a comfortable place, where the owner can assemble and paint hive parts, wire frames, and do many other jobs which are necessary in an up-to-date apiary.

Requisites for Handling Bees.

Everybody handling bees requires a veil, smoker, and hive tool. A suitable veil may be made from about a yard of black brussels net sewn up to form a cylinder with the hem turned at both ends. This allows elastic to be threaded through, making the top fit snugly on the crown of the hat. Black permits a better vision than white net and is not so trying to the eyes.

The smoker (Plate 142, fig. 1) is simply a metal fire box attached to a small pair of bellows. It is easily lighted, and should always be at hand ready to subdue any bees showing fight. Many materials may be used for fuel, such as pieces of old chaff bags, wood shavings, fibrous bark of stringy-bark trees, or rotten wood.

Some sort of hive tool (Plate 140, fig. 1) is also required, and for this purpose many beekeepers use a screwdriver, a chisel, or even an old knife, but a specially-made tool is best. It is used to lift or ease any portion of the hive that gets stiff with wax. Any burr comb—that is, pieces of wax built about the frames by the bees as braces—may easily be removed with this tool.

Requisites for Extracting Honey.

The combs from which the honey is to be extracted are removed from the colony and shaken, a slight upward movement of the frame, followed by a quick reversal and downward shake, resulting in dislodging the greater proportion of the bees. As combs filled with sealed honey cannot be shaken sufficiently vigorously to remove the remaining bees owing to the risk of breakage, the bees that still remain after the first shake have to be brushed off with a soft, specially made brush called a bee-brush (Plate 140, fig. 3). A bunch of grass or weeds will, however,

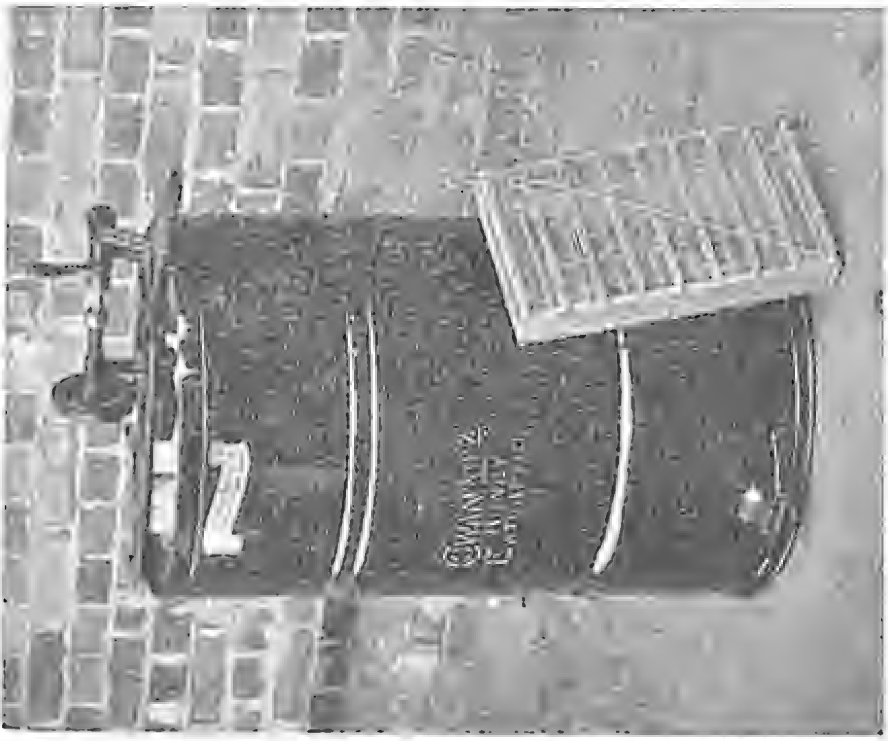


Fig. 1. Honey extractor.

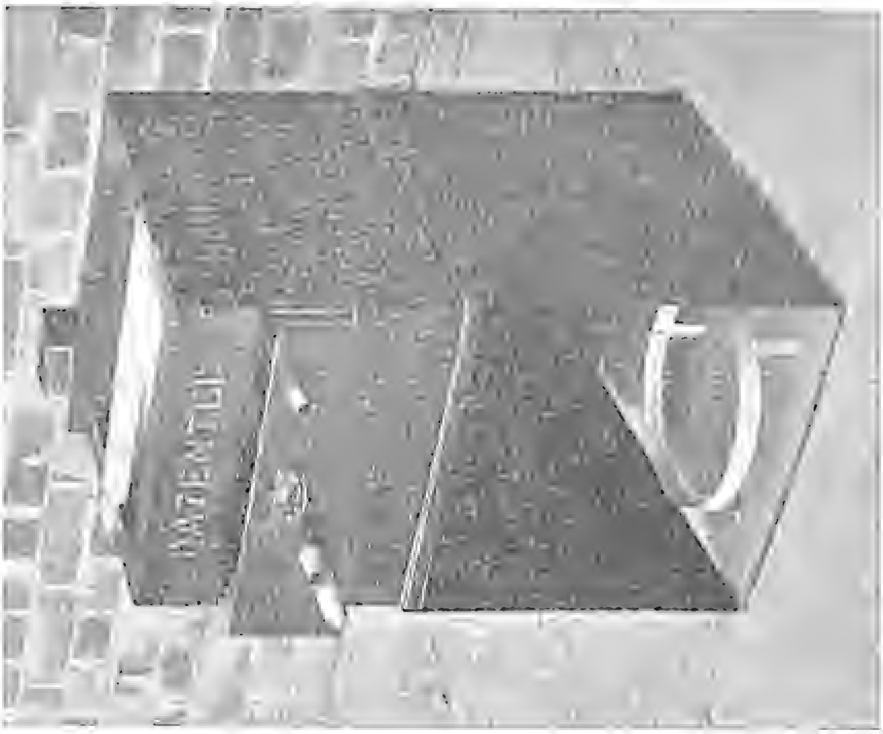


Fig. 2. Beuhne reducer.

Plate 141.

usually serve the purpose just as well. The only advantage of a brush is that is it always ready for use. Some form of covered carrier should at once receive the combs when freed from bees, and this comb-box may be conveniently mounted on a wheelbarrow. Empty supers can be used as a comb-box.

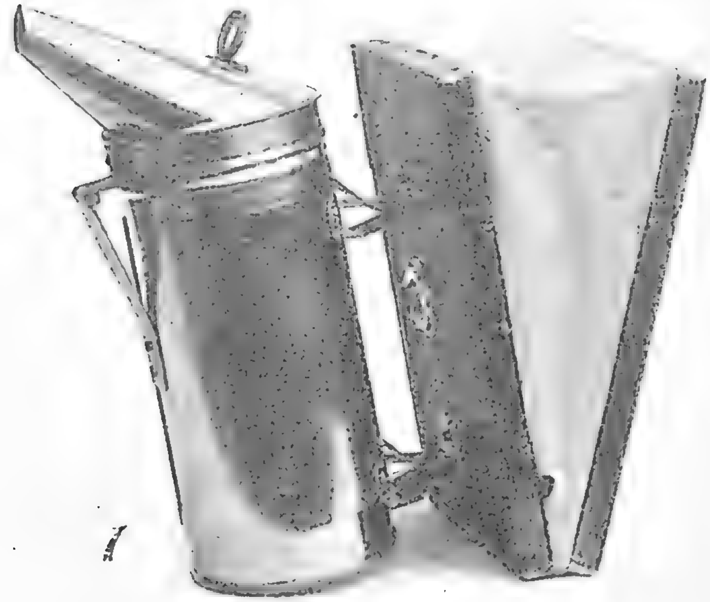
As a first step in extracting the honey from the combs it is necessary to slice off the wax cappings by means of an uncapping knife (Plate 140, fig. 2). The combs should be uncapped and extracted while still warm from the hive, and the bevelled edge of the specially constructed knife should be kept as sharp as a razor to prevent bruising or crushing the sides of the cells. When using the knife the bevelled side should be next to the comb and the severed cappings allowed to fall over the unbevelled face of the knife. The work of uncapping is also greatly helped if the knife is kept immersed in hot water between uncapping each comb.

Two uncapped combs of about equal weight should be selected for balancing in a two-frame extractor in order to reduce the vibration. They are then placed in the comb-baskets of the honey-extractor (Plate 141, fig. 1) when by turning the crank-handle the baskets are revolved round a central shaft inside a cylindrical metal tank, and the honey is thrown out from one side of the combs against the side of the tank by the centrifugal force produced. The combs are then reversed and the turning process repeated. The frames are now ready to put back in the hive, where they are quickly licked dry by the bees and any minor damage repaired. Larger honey extractors capable of handling as many as forty-two frames at once are available.

Newly extracted honey should be permitted to stand in a tank for a few days, so that the air and froth which go through the strainer which constitutes a part of the tank may come slowly to the surface. The clear honey may then be drawn off from below and tinned. A suitable storage container for honey may be improvised from a clean, empty petrol drum by inserting and soldering a honey-gate (Plate 140, fig. 4) near the bottom of the drum. There are several machines called reducers or cappings-melters (Plate 141, fig. 2) for automatically separating the honey which is associated with the wax in the cappings removed by the uncapping knife. Although differing in detail, they all work on the same principle, namely, by melting the wax, and by using the difference in the specific gravity of heated honey and wax to separate them through different outlets into two separate vessels. A cappings-melter is also convenient for melting the honey-comb from box-hives, or that taken from bee trees. The saving in time effected by the cappings-melter is so great that in a little while its use must become universal wherever extracted honey is produced.

Sections and Separators for Comb Honey Production.

There are two general styles of section in common use differing in the method of spacing, the bee-way section (Plate 143, fig. 3) in which the greater part of the bee space is provided by the section itself, the rest of the bee space being formed by the separator, and the plain section (Plate 143, fig. 4) in which the whole of the bee space is provided by the separator; each style has its advocates and each offers some advantages. The standard size of both bee-way and plain sections is $4\frac{1}{4}$ inches square, but the width is $1\frac{7}{8}$ inches in the former and $1\frac{1}{2}$ inches in the latter. The extra width in the bee-way section is for the purpose of



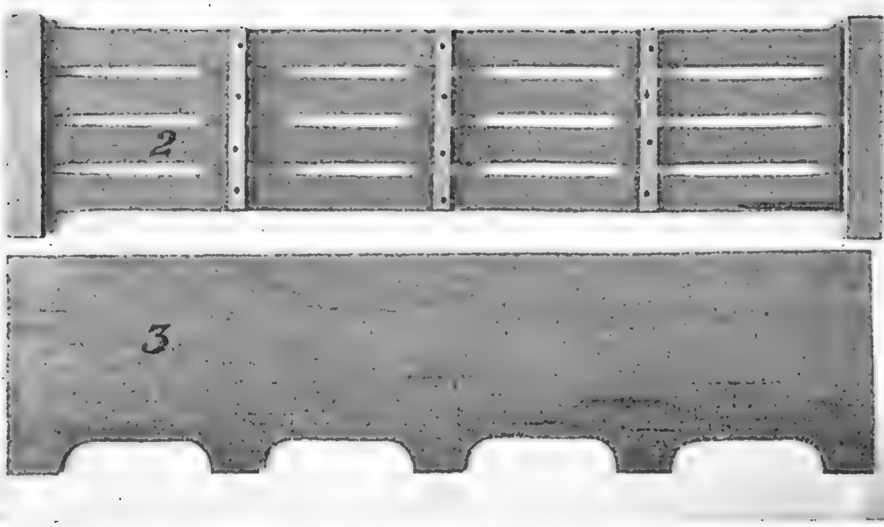


PLATE 142.
Fig. 1. Smoker. Fig. 2. Fence separator. Fig. 3. Slotted separator.

spacing and does not add to the thickness of the comb. Sections may be purchased stamped out in the flat (Plate 143, figs. 2 and 3) ready for folding.

Before folding a section the V cuts are wetted with hot water, which toughens the fibres of the wood and prevents breakage when folding. The next step is to fasten a narrow strip of foundation, called a starter, along the centre of the top and the bottom as a guide to the bees. The lower starter should be not more than $\frac{3}{8}$ of an inch high, for, if too high, it will fall over. This procedure has the advantage of preventing bulging, and it ensures that uniform-sized cells will be formed, the honeycomb consisting exclusively of worker type cells.

When fastening foundation it is convenient to work with a wooden block fitting easily in the inside of the section. The face of the block should come a fraction less than half way through the section, the top of the block standing at an angle of 40 degrees from the operator. The section is placed over the block, and the strip of foundation is then dropped in position. A small quantity of hot beeswax is then poured along the edge of the foundation, thus cementing it firmly to the centre of the section. The section is reversed, and the process is repeated with the second strip.

Separators are made of strips of thin wood, and are used between the rows of sections to compel the bees to build all the combs straight and to maintain or assist in maintaining a bee-space within the sections. When used in conjunction with plain sections they are called fence separators (Plate 142, fig. 2), and they have transverse cleats at regular intervals on both sides, binding the series of slats together, the cleats being so spaced as to be opposite the uprights in the sections. These fence separators allow of free ingress and egress to the sections and overcome to a certain extent the bees' feeling of isolation. On account of the plain, equal sides of the no-bee-way or plain section, it is necessary to have a fence separator on the outside as well as in the inner rows to provide a passage way. Otherwise the sections flush against the sides of the super are closed to the bees. When fence separators are used, super springs are placed behind the outside separator to keep the sections wedged in.

The separators used in conjunction with beeway sections (Plate 142, fig. 3) are much simpler than the fence separator, consisting of a plain piece of slightly scalloped wood, the cut-out portions corresponding with the scallops in the sections. Five of these slotted separators are placed between the rows of sections, none being necessary on the outside. As in the case of the plain sections, springs are used to maintain the sections firmly in position.

The approved method of supporting the sections in the super is to have what are termed section-holders (Plate 143, fig. 6) resting on two tin strips (Plate 143, fig. 1), one at each end of the super. The section-holder resembles a shallow frame without top bar, and is the same width as the sections. Each holds four sections, any one of which can be removed from the top, or each frame of four sections removed from the centre to the outside row, or vice versa.

The social nature of bees makes them averse to working in small detached groups in comb-supers, and they sometimes show a disinclination to accept the prepared sections. To overcome this the brood chamber should be opened, and two or more of the outside combs, which will probably contain honey only, should be removed, and frames of

Plate 143.

Fig. 1. Tin strip.
Fig. 2. Plain section in the flat.
Fig. 3. Beeway section in the flat.
Fig. 4. Plain section folded.
Fig. 5. Beeway section folded.
Fig. 6. Section holder.

foundation alternated with the brood-combs. There are then no empty cells below to hold honey, for as fast as the new foundation is built out the queen will occupy it with eggs, and consequently the bees are forced to store the honey above. Should a colony swarm in preference to storing honey in the comb-super, it should be hived on frames of foundation and a queen-excluder placed over the brood chamber, the comb super being finally placed on top.

The removal of comb from the hive without damage is attended with more risk than is the case with extracted honey. Smoking the bees is not advisable, for they will immediately puncture the cappings of the comb in their hurry to secure provisions. This damage to the cappings is not only unsightly, but it depreciates the value of the product.

To overcome this a Porter bee-escape (Plate 144, fig. 4) is fitted to a thin board the full size of the hive. On one side of the board slats are nailed to slightly raise the super from the brood chamber. A hole, corresponding to the one on the escape, is then bored through the centre of the board and the escape tacked over it. The bee-escape board should be placed in position without using smoke, and this is best accomplished by first gently lifting the super from the brood chamber from the rear and allowing the super to rest on its front edge. The escape board is then inserted between the two divisions of the hive, the super is lowered on to the board, and the whole is brought into alignment. The bees in the super will pass through the escape to the brood nest below but are unable to return, and if the escape is placed on the hive in the evening the super may be removed, practically free of bees, next morning. When bees leave the super in this gradual way they make no attempt to carry any honey down, and sections are therefore rarely disfigured.

SECTION IV.—COMMENCING BEEKEEPING.

Returns to be Expected.

Although apiculture is extremely fascinating to most people who have a taste for the study of nature, the income to be derived from it is generally the chief factor in leading one to undertake the care of bees. Where large apiaries are planned, they require much hard labour and great watchfulness; the performance of the work at stated times is imperative, and the beekeeper has few opportunities of making a leisurely study of their natural history and habits, his time being almost wholly taken up in attending to the most apparent wants of his charges.

Many people ask for information regarding the profit to be derived from beekeeping, but it is very difficult to answer this question except in a general way. Even the best situations, like all others, are subject to reverses, the result of drought or excessive wet. Under these adverse conditions the beginner must bear in mind that much experience is necessary to enable him to turn to the best account seasons below the average, while during periods of severe drought it will take considerable understanding of the subject, energetic action, and some sacrifice to tide over without disaster. On the whole, there should be expected from beekeeping only fair pay for one's time, good interest on the small capital invested, and a sufficient margin to cover contingencies.

Where to Commence.

Any place where farming or fruit-raising can be successfully followed is suitable for the profitable keeping of bees in a limited way

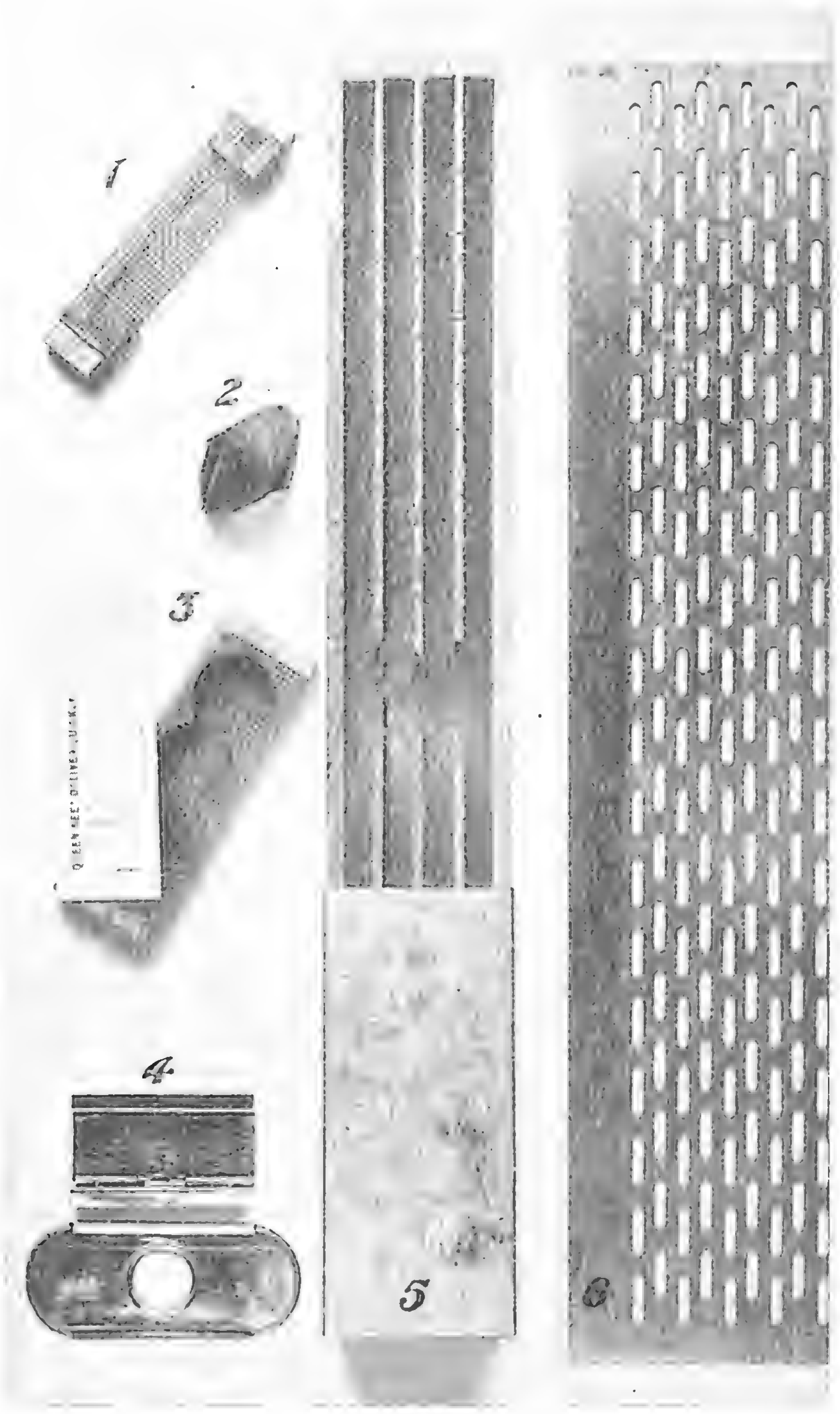


Plate 144.

Fig. 1. Introducing cage.
Fig. 2. Nursery cage.
Fig. 3. Mailing cage.
Fig. 4. Porter bee escape opened to show inner springs.
Fig. 5. Alexander feeder.
Fig. 6. Queen excluder.

at least. It is evident, therefore, that if the bees are not to be the main source of income, the place where one happens to be situated is quite suitable, as the ability of the bees to draw their sustenance for 2 or 3 miles around must be taken into account in estimating the possibilities of a locality.

On the other hand, when bees are to be kept more extensively as a sole means of livelihood, one must be prepared to go into the bush as soon as the elementary knowledge and some experience in handling bees has been acquired. Queensland possesses a splendid honey-producing flora in her forests, of which enormous areas still remain unoccupied by the beekeeper.

Having decided on the district in which to commence, the prospective apiarist should examine as many places as possible within it, weighing the advantages or otherwise of each site before coming to a final decision. Probably the best sites are those consisting of good mixed eucalyptus forest situated a little inland from the coast. The greater the variety of trees the better, as most eucalypts flower well about one season in three, and only moderately during the other two.

The nectar-producing flora will be found to vary considerably in different districts, according to their soil, rainfall, and elevation. For instance, the Darling Downs, which is rather sparsely timbered, more than balances this deficiency by a rich ground flora, consisting of weeds and low herbage which flower profusely during the spring months.

Later in the season there is usually a good flow from lucerne. This plant secretes very little nectar during the early summer, but after Christmas it continues to yield well until the close of the season. It is probable that the warm and humid atmospheric conditions which generally occur at this period may be more favourable for the secretion of nectar. Apiaries suitably situated in these districts will produce quantities of high-grade honey.

In the coastal belt the conditions are somewhat different. The chief nectar-producing trees are Leptospermum, Melaleuca, and other swamp shrubs in the spring, various mangroves and eucalypts during the summer months, and tea-tree during the autumn. The honey produced is darker in colour, and consequently realises a lower price than the Downs honey. This disadvantage, however, is offset by a more certain crop, due to the greater rainfall, the longer nectar-gathering season, and the much milder winters which are experienced in the coastal districts.

In certain localised areas, such as river flats and creek banks, trees other than eucalypts often occur in sufficient numbers to make a honey flow. These are silky oak, bean-tree, and river myrtle, as well as other representatives of the genus Eugenia, all of which are good honey-producing trees. In other districts where prickly-pear still exists, it is considered to be a most useful plant.

Jungle or rain forest sites are not favoured as honey producers, chiefly owing to the lack of any outstanding nectar-producing tree. Moreover, the moist, shady conditions cause the bees to be backward in building up in the spring, for bees require warmth and sunshine to produce a satisfactory honey crop. When these areas have been cleared, however, and laid down in pasture, white clover is sometimes sown with the grasses. This plant grows vigorously in the virgin soil, whitening the paddocks with its flowers in early summer. Scotch thistles usually

abound in such localities, growing from self-sown seed. If some of the land around is being cultivated with crops of maize, pumpkins, &c., these districts may be classed among the best for keeping bees.

In selecting a bee site, consideration should be given to the following two points:—Firstly, see that there is a permanent water supply within a short distance of the apiary. The quantity of water fifty to one hundred colonies will dispose of would surprise many people. Secondly, if the beginner intends keeping bees on a large scale, he should ascertain that no other bees are being kept within several miles of the selected site, as an otherwise suitable foraging ground may prove to be already occupied by a neighbouring beekeeper.

How to Commence.

A beginning is usually made in one of the following ways, or by all of them combined:—

Full Colonies of Bees.—These may be purchased from established apiaries or bought up here and there until the desired number have been obtained. They should be carefully examined before purchase, as there is some risk of getting neglected colonies containing old or poorly drawn-out combs. When a number of colonies have been acquired in this manner, it is advisable to purchase a full colony from a reputable queen breeder or bee-supply firm. It will be guaranteed high-grade Italian and possess a tested queen. From this colony all the other colonies should later on be requeened, thus improving the strain of the entire apiary.

Swarms.—In the spring arrangements may sometimes be made for the purchase of swarms from beekeepers who do not wish to increase their number of colonies, or the beginner may see a swarm or two himself. Hives with frames of foundation should be bought and prepared beforehand. When a swarm has settled or clustered it should be hived in an ordinary box fitted with a lid, and, as soon as the bees are in, carried to the spot which the frame hive is to occupy. Towards evening, when the bees are not likely to rise in the air again, the frame hive is placed in position, a bag or cloth spread out in front of the hive entrance in such a way as to provide an easy passage-way into the hive, and the swarm shaken or dumped out of the box on to the cloth. If the bees are slow in entering the frame hive, or if a considerable number remain outside, they may be gently driven in by blowing a little smoke on them; none, however, should be blown into the hive.

Nuclei.—Beekeeping may also be commenced in the spring by purchasing nucleus colonies. These consist of small hives holding three frames, and contain a queen accompanied by a few hundred workers, together with some stores. As the season advances, these nuclei will quickly build up, and may then be transferred to full-size hives provided with sheets of foundation.

Wild Bees' Nests from Trees.—When commencing on a new site, the first procedure is to find and remove all bees from bee-trees in the neighbourhood. By doing this the competition from the wild bees is eliminated, and a number of hives may be stocked at very little expense. The easiest way to find them is to make a systematic search of all water-courses and other sources of water, and any bees found obtaining water should be carefully sight-lined and their home found. The tree should be felled and the nest cavity cut open. Sometimes the shock of the fall may so disorganise the colony that it will offer little or no resistance

and may easily be transferred to a frame hive. The following is a good method for transferring the brood comb from box hives, and as a modification of this method, by omitting the drumming process to drive out the bees, is also most suitable for transferring the brood comb from wild bees' nests, it will be described in some detail.

Transferring from Box Hives and Wild Bees' Nests.

Before commencing operations a bucket of water should be close at hand, as the operator should wash the tools and his hands frequently to keep them free from honey. The hive must, of course, be ready and the smoker lighted. A hammer and cold chisel are needed for opening the hive. A ball of thin string, a large knife, and a second hammer or two heavy sticks for drumming on the box hive are also required.

Smoke should be blown into the entrance of the box hive, after which it should be removed and the new hive, preferably with at least one drawn comb in it, placed exactly on the old stand to receive the returning bees. The bottom should be removed from the box hive, which should then be placed on its side close to the new hive. With two sticks or hammers the beekeeper raps on the sides of the box hive with regular and continuous strokes. After a few raps the bees will begin to run towards the open end and enter the new hive. The drumming should be continued for ten or fifteen minutes, until three-fourths of the bees have entered. If the queen is not seen as the bees pass in, the drumming should be continued a little longer.

One side of the box hive is now removed to expose the combs, which are cut out and laid aside until the brood is reached. A large piece of brood comb is laid flat on paper or a board and the frame (unwired) placed loosely on top. The outline of the inside of the frame is marked on the comb with the point of a knife, the frame is set aside, and the comb is cut to fit tightly in the frame. Smaller pieces may be fitted to suit, and the whole tied with a few turns of string. When all the brood comb has been transferred in this manner, the remainder of the frames to fill the hive should be filled with full sheets of foundation.

When transferring the brood comb from trees, as outlined in the preceding paragraphs, as many of the bees as possible should be shaken into the frame hive; then, if the hive is placed on or near the spot where most of the remaining bees are, they may be induced to go in with the help of a little smoke. In the evening the hive should be closed by tacking a strip of wire gauze across the entrance, after which it may be removed to its permanent position. Should the queen have been killed, the bees will make several queen cells, and another queen will hatch out about the sixteenth day.

After transferring is finished, all scraps of comb and wax should be cleaned up to prevent robbing, and, if necessary, some of the honey should be given back to the bees for stores. After a few days the bees will have securely fastened the combs, and the strings may be removed. As the bees become established on the newly-built combs, the frames of transferred comb are gradually worked to the outside of the cluster of bees, then finally withdrawn and melted for wax.

Moving Colonies of Bees.

Bees remember a location so well that some difficulty is encountered by the beginner in moving them to a new stand. They may, however,

be moved to a distance of 1½ mile or more without danger of their returning, because they will have to learn their surroundings before they can venture far from the hive. When it is desired to move them to a fresh spot a short distance from their old position, much more difficulty is encountered. For instance, if the hive should be moved 30 or 40 feet away, the returning field bees will fly straight to the spot previously occupied by their hive and hover there, hopelessly lost. There are two methods of successfully moving colonies a short distance. One is to move the hive a few inches daily, when the bees do not realise that they are being moved; the other method is to shift them several miles away for a week or two, by which time they will have forgotten the old site, after which they may be returned to any desired position in the old yard.

Bees excited by moving or any other disturbance generate a great deal of heat, and if moved during hot weather the hive cover should be removed and a moving screen substituted. This consists of a screen wire top in the place of a regular hive cover. It allows the escape of excess heat that might melt the combs and kill the bees. The temperature may be greatly reduced and the bees quieted if a little water is squirted into the hive through the screen.

Laying out an Apiary.

In order to make the arrangement of the apiary as orderly as possible, it is necessary to mark out the sites that the hives are to occupy before placing them in position. The majority of beekeepers arrange their hives in straight rows. This is an excellent plan, provided they are sufficiently spread out. A minimum distance of at least 8 feet between each hive and 10 feet between each row should be allowed. Where the hives are close and the intervening spaces mathematically alike, more or less straying or drifting of young bees will occur, resulting in some colonies becoming unduly strong while others are depleted of bees. Drifting could also be prevented by putting alternate hives to face different ways and by leaving any shrubs, rocks, stumps, or other distinguishing object, so that their relative positions will give each hive an identity of its own.

Numbering Hives.

It has been found to be a great saving of time if some method of recording the particulars of each colony is adopted. Perhaps the simplest way is to stencil a number on each cover, because, although the bodies may be changed about during various manipulations, the covers always remain on the same spot. If a page in a note-book is allotted a corresponding number, the various records relating to each colony may be easily seen, permitting necessary manipulations to be planned in advance.

[TO BE CONTINUED.]

TO CRANK THE ENGINE.

Bruised and skinned knuckles, caused by the cranking handle slipping while starting the farm engine, may be easily prevented. Cut a circular piece the size of a dinner-plate from a petrol-tin. Punch a hole in the centre and remove a 3-inch segment; make two cuts from the outer edge to the hole. Bring the edges together and fasten with a rivet. You have now a shallow cone: slip this over the handle and there will be no more danger when starting up.

Fertilizing Experiments with Citrus Fruits.

THE Minister for Agriculture, Mr. Frank W. Bulcock, announced recently that, following representations made to him early in 1933, he had given instructions for fertilizer experiment plots to be established on citrus orchards on Tambourine Mountain, with a view to determining whether the cropping capacity of the trees could be increased by the use of artificial fertilizers. Accordingly, the Director of Fruit Culture, Mr. H. Barnes, and Fruit Inspector C. N. Morgan, visited Tambourine Mountain in February of that year, and selected plots of trees for the trials on Mr. H. Curtis's and Mr. W. Green's orchards. The soil on Mr. Curtis's orchard carried a heavy growth of jungle originally, while on Mr. Green's orchard the soil was more of a forest nature. The trees were pruned, and three different fertilizer mixtures were applied to different plots on the two orchards. Later they were given a dressing of hydrated lime. In February of the following year, another dressing, equal to half the previous quantity of fertilizer, was applied. In July of the same year a third application was made, the same quantity being used as with the second dressing.

The results of the first year's trial have shown a very big increase in crop, as the following table shows. It is recognised that 1934 was a good year for citrus fruits; the results, therefore, are not being taken as final, and the experiments are being continued.

It will be noted that No. 3 plot, to which organic fertilizer was applied, has shown the biggest increase in crop—over 200 per cent. It is also evident on inspection that the trees in this particular plot are more vigorous than those of the other two plots, and are of a darker green colour.

One of the main features of the soil in Tambourine orchards is the apparent lack of humus after the natural timber has been cleared for several years, and it would be advisable for growers to plough in green manure crops during the winter months:—

RESULTS OF EXPERIMENTS.

Tree No.	1st Fertilizing, 2/3/33. Applied per tree.	2nd Fertilizing, 13/2/34. Applied per tree.	3rd Fertilizing, 3/7/34. Applied per tree.	Average Crop prior to 1934 in bushels.	Crop 1934 in bush.	1933	1934
1, 2	3 lb. Sulphate of Ammonia.. ..	1½ lb. Sulphate of Ammonia.. ..	1½ lb. Sulphate of Ammonia.. ..	1¾	7		
				2¾	5		
3, 4	4 lb. Superphosphate	2 lb. Superphosphate	2 lb. Superphosphate	2¾	6		
				1½	2½		
5, 6	4 lb. Nauru Phosphate	2 lb. Nauru Phosphate	2 lb. Nauru Phosphate	2½	4		
				3½	7		
7, 8, 9	4 lb. Sulphate of Potash	2 lb. Sulphate of Potash	2 lb. Sulphate of Potash	2	5		
				2	3½		
				2	4	20¾	44
10, 11	4 lb. Sulphate of Ammonia.. ..	2 lb. Sulphate of Ammonia.. ..	2 lb. Sulphate of Ammonia.. ..	1¼	4		
				3½	8		
12, 13	5lb. Superphosphate ..	2½ lb. Superphosphate ..	2½ lb. Superphosphate ..	1½	4		
				1	3		
14	5 lb. Bonedust ..	2½ lb. Bonedust ..	2½ lb. Bonedust ..	3	9		
15, 16, 17, 18	2 lb. Sulphate of Potash	1 lb. Sulphate of Potash	1 lb. Sulphate of Potash	3	6		
				3	6		
				2	5		
				2½	6	20¾	51
19, 20	4 lb. Dried Blood ..	2 lb. Dried Blood ..	2 lb. Dried Blood ..	3	9		
				1¼	4		
21	6 lb. Bonedust ..	3 lb. Bonedust ..	3 lb. Bonedust ..	¾	4		
22, 23, 24, 25, 26, 27	3 lb. Sulphate of Potash	1½ lb. Sulphate of Potash	1½ lb. Sulphate of Potash	2¼	9½		
				2¾	7		
				3	5½		
				½	3½		
				1¼	4		
				1¾	3¾	16½	50¼
				58	145¼	58	154¼

Lantana *(Lantana camara)* and Poison Peach *(Trema aspera)*.

THEIR EFFECTS ON STOCK.

By K. S. McINTOSH, B.V.Sc., Veterinary Officer, and C. T. WHITE, Government Botanist.

LANTANAS are common in garden culture in warm temperate countries, and in colder ones are often cultivated in hot houses. Several forms of the common lantana are recognised. Two red flowering varieties have been described—namely, Var. *crocea* and Var. *sanguinea*. These are very close, distinctions given by L. H. Bailey in "The Standard Encyclopædia of Horticulture," being as follows:—

Var. *crocea*—Flowers opening sulphur yellow and changing to saffron.

Var. *sanguinea*—Flowers opening saffron yellow and changing to bright red.

The former, I think, is the common bright flowering lantana naturalised in Queensland, the latter being common in garden culture, and probably run out in one or two localities. The typical form, which is by far the more abundant, has flowers of a much paler hue, opening pale cream with a dark yellow centre, and dying off lilac or purple.

There has been quite a good deal of experimental work carried out with feeding tests on the different varieties. In Southern Queensland and in coastal New South Wales the red flowering forms have been found more toxic, but in experiments carried out at the Animal Health Station, Oonoonbah, near Townsville, the common or purplish flowering variety has been found the more toxic, red flowering forms being more or less innocuous.

LANTANA (LANTANA CAMARA).

Description.

A rambling shrub, stems 4-angled, the angles bearing short, somewhat recurved prickles. Leaves opposite, bright green above, paler beneath, averaging $2\frac{1}{2}$ in. long and $1\frac{1}{2}$ in. wide, but variable as to size, on short stalks about $\frac{1}{3}$ in., subcordate, rather pointed at the apex, scabrid (rough to the touch) above, the veins and veinlets clothed with white, rather soft hairs beneath, margins serrate-crenate. Flowers in heads of about three flowers, about 1 in. across, on stalks about as long as the leaves, opening pale-cream with a dark-yellow centre, dying off lilac or purplish. Fruit fleshy, purplish-black when ripe, ovoid, about $\frac{1}{3}$ in. long, borne on the floral receptacle which becomes elongated, thickened and somewhat fleshy.

Distribution.

A native of tropical America, now widely distributed as a weed over the tropical and sub-tropical portions of the world.

Poisonous Properties.

The poisonous principle of lantana is not known. It is probably an ethereal oil.

PLATE 145.—LANTANA (*Lantana camara*).

Symptoms.

The symptoms of lantana poisoning are weakness, staggery gait, dark stinking manure, owing to the presence of decomposed blood; the animal sometimes begins by scouring, but in most cases becomes very constipated, discharges from eyes and nose, the skin of the nose peels, milk supply diminishes, then ceases, the animal runs a very high temperature, and eventually either dies or makes a slow recovery. Frequently jaundice is also noticed.

Treatment.

Place animal in a cool, shady place with a plentiful supply of water and a quantity of fresh green feed. Plenty of bedding should be given if animal is placed in a shed.

Give frequent enemas with luke-warm soapy water, and administer the following drench:—

Raw Linseed Oil	1 quart
Laudanum	1½ oz.

The above dose is for a mature cow, and may be decreased for younger stock.

POISON PEACH OR WILD PEACH (TREMA ASPERA).

Description.

A shrub or small tree, branchlets clothed with rather soft hairs. Leaves usually 2-3 in. long, and about ¾-1 in. broad, borne on stalks of 3-4 lines, the base more or less rounded, the apex tapering into a rather slender point. Upper surface rough, with short rigid hairs, under surface velvet-hairy, edges serrate. Flowers small, borne in short bunches (cymes) in the axils of the leaves. Fruit black, ovoid or globose, 1-2 lines in diameter.

Distribution.

A very common plant of Northern and Eastern Australia, often comes up very thickly as secondary growth on "scrub" farms.

Poisonous Properties.

Trema aspera, variously known as Wild Peach, Poison Peach, or Peach Leaf Poison Bush, is generally regarded as one of our worst poisonous plants, and there are numerous references to it as a plant poisonous to stock in the writings of Australian botanists. It has been held by some that the harmful effects attributed to the plant were due to its tough and indigestible nature when ingested by stock, in the absence of softer and more palatable food, as the plant belongs to a family, the *Ulmaceæ* or *Elm Family,* the members of which are, as a general rule, quite wholesome. It has been found, however (see Smith and White, in "Proceedings of the Royal Society of Queensland," vol. 32, No. 11) that at times the plant produces a prussic-acid-yielding glucoside, and at such times if eaten in quantity, especially by hungry stock on an empty stomach, might cause death. The presence of this poisonous principle in quantity would, on the whole, fortunately appear to be rare. Its occurrence is very spasmodic, and what controls its formation it is impossible, on our present knowledge, to say. Wild Peach is often eaten by ordinary paddock stock in quantity, without any ill effects following, and in some districts has even been regarded as an important drought fodder.

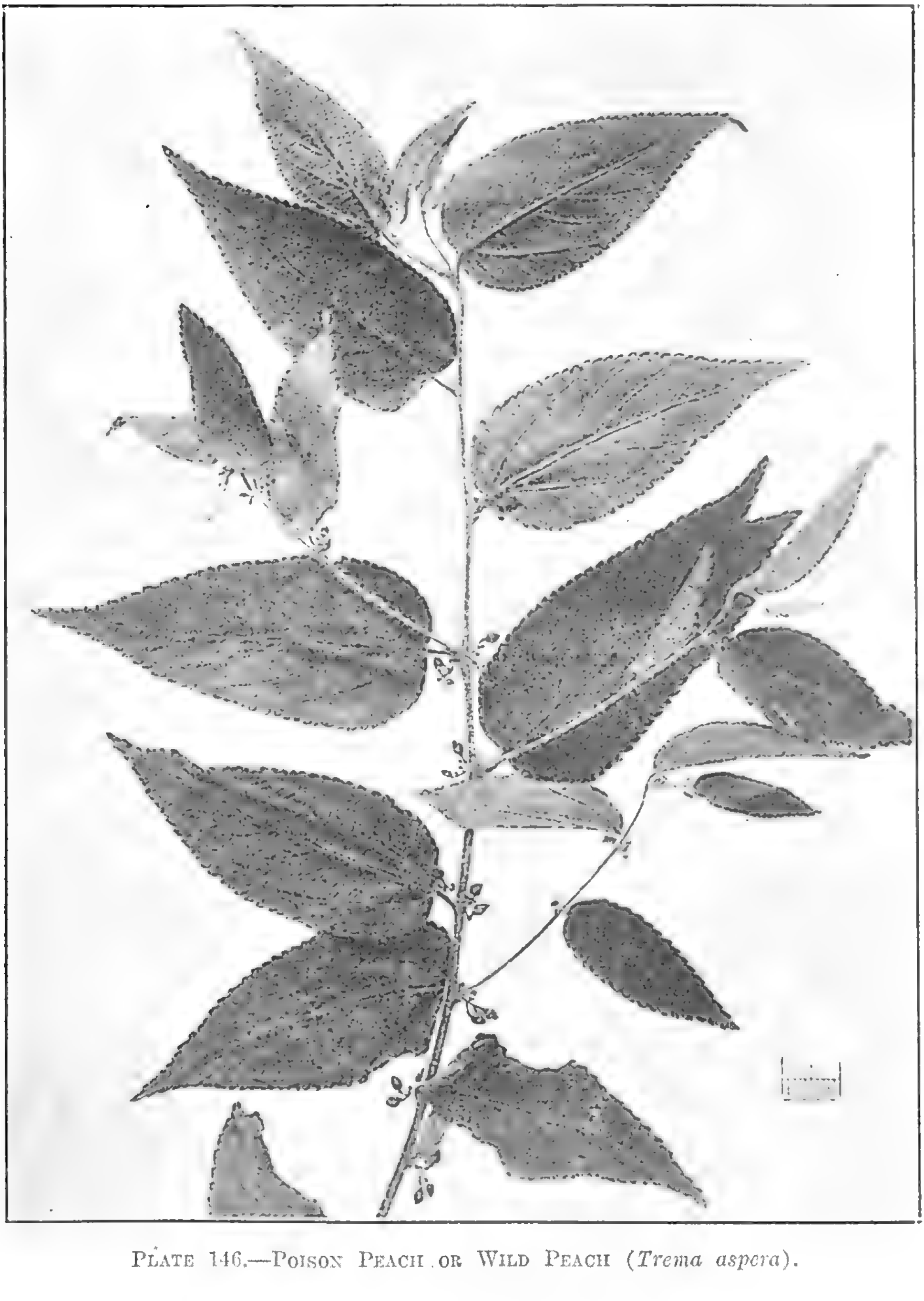


PLATE 146.—POISON PEACH OR WILD PEACH (*Trema aspera*).

Symptoms.

The symptoms of peach poisoning depend on the quantity eaten. There may be sudden death, but usually general excitement, struggling, followed by depression, shivering, quick breathing, and staggering.

The membranes of the eye and mouth may have a bluish hue due to air hunger.

Treatment.

If peach poisoning is common on the property, it would be economical to keep a few bottles of the following antidote on hand, and administer *as soon as the symptoms are noticed*:—

Bottle No. 1.

Perchloride of iron	3 oz.
Water	8 oz.

Bottle No. 2.

Calcined magnesia	1½ oz.
Water	8 oz.

Add No. 1 to a pint of water, add contents of No. 2 and stir. Administer the whole quantity.

Also inject ½ to 1½ oz. of sulphuric æther under the skin with a hypodermic syringe.

In both of the above cases the animals should immediately be removed from access to the plant. If practicable, eradication of the plant is the best method of preventing the trouble.

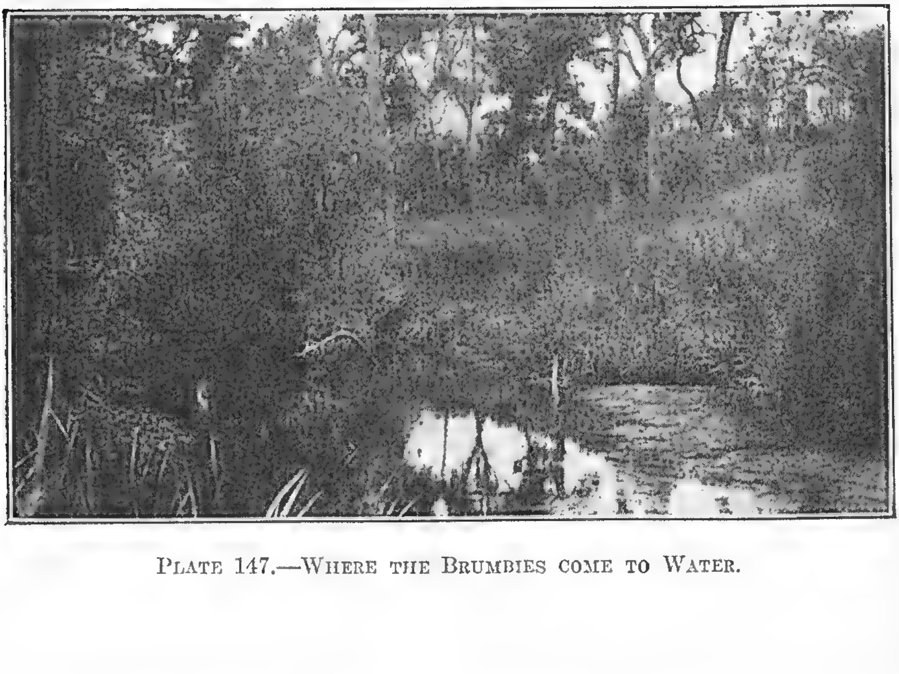


PLATE 147.—WHERE THE BRUMBIES COME TO WATER.

Inland Pastures.

PART II.

Response during 1934 Season of Mitchell and Other Grasses in Western and Central Queensland.

Compiled by S. L. EVERIST, Assistant to Botanist, from reports received.

[A Report submitted to the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, on 14th April, 1934.]

(For Foreword and Part I., see March issue.)

Burke District, "Gulf Fall."

REPORTS were received from Messrs. D. G. Johnston, Land Ranger, Cloncurry; F. R. Dunn, District Stock Inspector, Cloncurry; S. C. Allan, Stock Inspector, Cloncurry; A. S. Moodie, Stock Inspector, Julia Creek; and C. E. Ellis, Stock Inspector, Hughenden. Most reports stated that where sufficient rain had fallen the response of the Mitchell grass had been satisfactory. However, the rainfall was apparently very patchy, consequently the amount of Mitchell grass in the area was below normal, and more general rains would be necessary for complete recovery. Mr. Moodie qualified his remarks by stating that where the country had been overstocked the response was very poor, even where satisfactory falls of rain had been received.

Specimens of all four species of Mitchell grass have been received from the district. Of these, *Astrebla pectinata* and *Astrebla lappacea* are generally regarded as the best, *A. elymoides* and *A. squarrosa* being somewhat inferior to them, but good fodder nevertheless. One report stated that *A. elymoides* was best for sheep, followed in turn by *A. lappacea* and *A. squarrosa,* while for cattle the order was reversed.

Edible herbage does not appear to be very plentiful in the Burke district, grasses being the principal fodder plants.

A report on the Barkly Tableland was received from Mr. F. R. Dunn, District Inspector of Stock, Cloncurry. He stated that the rainfall on the Tableland had been very patchy, but that where the falls had been sufficient the response of the grasses had been satisfactory. A fair amount of edible herbage grows on the Barkly Tableland.

Gregory North (Diamantina, Hamilton, Georgina Fall).

Reports on the district received from Messrs. J. B. Cardno, Inspector of Stock, Winton, and D. G. Johnston, Land Ranger, Cloncurry.—Around Winton itself the response to the early 1934 rains was not very good, although better than anticipated by many people. It was stated by many people that after eleven years' drought the Mitchell grasses would not come back at all, but a fair quantity came up after the rains. During the eleven years of drought sufficient rain fell each year to bring up a small quantity of Mitchell grass, which was promptly eaten off by stock or burned by the sun before seed could be produced, and from this it was argued that the Mitchell grasses would never respond well. Grasshoppers also did some damage to the young Mitchell grass. Curly Mitchell or Downs Mitchell (*A. lappacea*), Bull Mitchell (*A. squarrosa*).

and Weeping or Hoop Mitchell (*A. elymoides*) are all represented and are regarded as good feed, *A. lappacea* being the best and most drought-resistant.

Button grass (*Dactyloctenium radulans*) is also regarded as an excellent fodder which comes up quickly after rain and lasts until the slower-growing species have made some headway. The Winton district is reported as being essentially grass country, herbage being unimportant from the point of view of fodder.

The response in the Boulia district, as reported by Mr. Johnston, was rather patchy. In those areas which received rains in November and December, the Mitchell grass responded well, but in those areas which missed the early rains and received only the February rains, the response was poor. In no part of the area were the Mitchell grasses regarded as being back to normal. On the very open downs between the Hamilton and the Diamantina, the Mitchell grasses did not respond at all.

The growth of herbage in the Boulia district was very good, and on it sheep were principally dependent. Pig-weed (*Portulaca oleracea*) is regarded as the best, while Wild Spinach (*Tetragonia expansa* ?), Tar Vine (*Bœrhaavia diffusa*), Wild Cucumber (*Cucumis* sp.), Potato or Budoo Vine (probably *Ipomœa* sp. ?), and Daisy Burr, Bindy-eye, or Bogan (*Calotis hispidula*) are all good fodders. Sheep keep fat during the winter months by licking up the seeds of the last. Brown Top grass (*Eulalia fulva*) and Flinders grass (*Iseilema* spp.) are also important fodder plants.

Mitchell (Thomson-Barcoo Fall).

Reports have been received from Messrs. C. C. Barth, District Inspector of Stock, Longreach, and T. J. Costello, Land Ranger, Longreach.

Concerning the response of the Mitchell grasses, these are somewhat conflicting. Mr. Barth, on 22nd March, stated that the Mitchell grasses responded very poorly even in places where conditions were favourable, and where it was reasonable to expect good results. Only a percentage of the old roots responded to the good rains, and there appeared to be an absence of young plants, which would suggest that very little seed had germinated.

Mr. Costello on 16th April wrote that Mitchell grasses in the Longreach and Jundah districts responded remarkably well, having regard to the seasonal conditions. Old tussocks believed to be dead showed a wonderful recovery. These and the young grasses received a setback through weather conditions and a plague of grasshoppers.

All the known species of Mitchell grass have been forwarded from this district, together with three Flinders grasses (*Iseilema membranacea*, *I* sp. nov., and *I. vaginiflora*), Brown Top (*Eulalia fulva*), Button grass (*Dactyloctenium radulans*), and numerous other grasses and herbage plants.

Saltbushes (*Atriplex* spp.), Pigweed (*Portulaca oleracea*), Wild Daisy (*Calotis hispidula* ?), Tar Vine (*Bœrhaavia diffusa*), and Potato Vine (probably *Ipomœa reptans*) are regarded as being the most outstanding herbs in the Longreach and Jundah areas.

Warrego (Bulloo, Paroo, and Warrego Fall).

Reports were received from Messrs. E. J. Tannock, District Inspector of Stock, Charleville, and W. S. Addison, Land Commissioner, Charleville. Both reports state that in general the response of the Mitchell

PLATE 148.—OVERSTOCKING THE "LONG PADDOCK."

Showing the effect of very heavy stocking on Mitchell grass, Noondoo Station, near Dirranbandi. Stock-route with older poley on left; Mitchell grass paddock on right. December, 1934.

grasses to the 1933-34 rains was disappointing. Mr. Addison stated that climatic conditions were not suitable for the production of grass, but were exceptionally favourable for the growth of herbage. The summer was exceptionally cool, and consequently the herbage remained green until the hot weather in March, when it commenced to wither. The herbage growth was phenomenal, and according to old residents of the district, was the best for at least thirty years.

Mr. Addison is of the opinion that Mitchell grasses do not seed every year, but that every second or third year they produce a good crop of seed. His report also stated that where overstocking is practised the Mitchell grasses are definitely diminishing. However, he is of the opinion that if the country is not overstocked and favourable climatic conditions operate, the Mitchell grasses will come again from seed.

Mr. Tannock reported that the response on some pastoral holdings had been fairly good, but that the Mitchell grasses were not present in such quantity as in some former seasons, indicating that there is a diminution of the Mitchell grasses, whilst on many smaller holdings and selections they have practically disappeared, due to the constant heavy and over-stocking, together with a series of dry seasons and droughts. According to Mr. Tannock, horses destroy Mitchell grass pasture by eating the seed heads and pawing up the tussocks, thus preventing the regeneration of the grasses either from seeds or from the old tussocks.

In March, 1934, the Assistant Government Botanist, Mr. W. D. Francis, visited the Charleville area for the purpose of making some observations upon the grasses in the field, and to ascertain the views of pastoralists and others upon the welfare of the principal grasses of the area. In his report upon this visit, Mr. Francis came to the conclusion that in heavily overstocked areas and in those grazed extensively by horses the Mitchell grasses were diminishing. However, he pointed out that this diminution was not general, but that where the Mitchell grasses were not overstocked they seemed to be as good as ever they were. Mr. Francis also made some suggestions for experiments to be carried out for the purpose of ascertaining the effect of keeping stock off a heavily stocked area from which the Mitchell grasses had been eaten out. He further suggested that experimental work should be done on the germination of the seed. Many other matters are discussed in Mr. Francis's report, but it is not proposed to deal with them here.

Regarding Flinders grass, Mr. Tannock and Mr. Addison expressed somewhat different opinions. Mr. Tannock stated that Flinders grass is regarded as a most valuable and nutritious food, and is eaten by all classes of stock in preference to any of the Mitchell grasses. Mr. Addison, on the other hand, said that there is very little Flinders grass in the district, and that it is a very overrated grass, but makes excellent hay and is fattening for stock. In fact, they will lick it up off the ground when it is dry. It has the disadvantage that about 60 points of rain during the winter months will turn it black and destroy it just at a time when the feed is required. Stock will not eat it until it is dry, and they prefer the other grasses. It is a wet-season grass, and flourishes during the seasonable rainy months of January till April; consequently there is generally a heavy crop of Flinders grass during the autumn. If the winter is dry and no rain falls, it provides an excellent crop of natural hay, but since about 60 points of rain at this time will destroy it, it is unreliable.

Mr. Tannock's report also stated that other grasses of outstanding value in the district are Blue grass (*Dichanthium sericeum*) and Brown Top grass (*Eulalia fulva*), which are just as nutritious as Mitchell grass, but not as drought-resistant. Barley grass (*Panicum decompositum* (?)), Button grass (*Dactyloctenium radulans*), Spring grass (*Eriochloa* sp.), Kangaroo grass (*Themeda australis*), Shot grass (*Paspalidium globoideum*), Star grasses (*Chloris* spp.), and White Top (*Pappophorum* sp.) are good fodder, and all are readily eaten by stock, though they are not equal in value to Mitchell, Flinders, and Blue grasses.

The outstanding herbs are Crowsfoot (*Erodium cygnorum* or *Geranium dissectum*), Trefoil (*Medicago* sp. (?)), Lamb's Tongue (*Plantago varia*), Clover and Pigweed (*Portulaca oleracea*).

In addition to the above list, which was forwarded by Mr. Tannock, Mr. Addison mentioned that there is a large amount of annual salt herbage after seasonal rains. This is chiefly confined to the black-soil flats from the Ward River to the Cooper. Stock do not relish this until dry, but apparently lick it up after it dries off. It is a quick grower and heavy producer. Carrots and crowsfoot flourish after favourable winter and spring rains, and during spring and early summer of 1933 the crops of these were phenomenal.

Maranoa.

Reports were received from Messrs. J. G. Cumming, Land Ranger, Roma; W. L. McKee, Land Ranger, St. George; T. W. Gillham, Prickly-pear Ranger, St. George; and A. Shield, Land Ranger, St. George. All reports stated that the Mitchell grass had responded well. Mr. Cumming, however, remarked that this was only the case where it had been allowed to seed biennially. Where the country had been overstocked for a longer period it did not respond so well and was choked out by Blue Bush (*Chenopodium auricomum*).

Only two species of *Astrebla* were forwarded, but all four have been collected from the district this season.

Flinders grass is not common in the area and is of little importance, due to the small quantity available. Mr. Cumming reports on the grass (*I. membranacea*) as follows:—"Responds quickly to rain and reaches maturity with a light rainfall. It is palatable in a green state but is not greatly relished by stock when dry. It is generally one of the last grasses to be eaten by stock and is not as good as it is reputed to be." This is rather surprising, as the general consensus of opinion seems to be that stock prefer Flinders grass when dry.

Other outstanding grasses in the area are Star grasses (*Chloris divaricata, Chloris truncata,* and *Chloris acicularis*), Blue grass (*Dichanthium sericeum*), Brown Top (*Eulalia fulva*), Shot grass (*Paspalidium globoideum*), Kangaroo grass (*Themeda australis*), Couch grass (*Cynodon dactylon*), Button grass (*Dactyloctenium radulans*), Coolah grass (*Eriochloa* sp.), *Bothriochloa intermedia,* and others. Of these the Star grasses (*Chloris* spp.) are particularly important as under heavy stocking they spread and tend to form a sward. The seed head soon blows away but the bottom growth remains. They come away quickly after rain and provide excellent forage for sheep. Many people regard them as the principal grasses of the district. They grow well in all soils except the heaviest black soil and the poor sandy country.

The principal herbs of the district are the various saltbushes (*Atriplex* spp.), Crowsfoot (*Eurodium cygnorum*), Geranium or Parsnip (*Geranium dissectum*), Carrot (*Daucus brachiatus* (?)), Red Burr (*Bassia echinopsila*), Pigweed (*Portulaca oleracea*), Lamb's Tongue (*Plantago varia*), Blue Bush (*Chenopodium auricomum*), Native Lucerne or Emu Grass (*Psoralea tenax*), and Nardoo (*Marsilea Drummondii*). Nut "Grass" (*Cyperus* sp.) is a very important fodder plant in the more southerly portion of the area around St. George and Dirranbandi. It is confined to the low-lying, heavy black-soil flats and is highly thought of by pastoralists. The Red Burr (*Bassia echinopsila*) mentioned above grows chiefly on red soil such as rung Sandalwood or Buddah (*Eremophila Mitchellii*) country. It is a small plant which grows fairly thickly and provides a good bulk of fodder. Sheep seem to be fond of it.

Darling Downs.

Reports received from Messrs. W. Dixon, Inspector of Stock, Goondiwindi; N. E. Kimmorley, Land Ranger, Goondiwindi; S. J. Monaghan, Inspector of Stock, Dalby; and H. McDonald, Inspector of Stock, Jandowae. From the Goondiwindi area Mr. Dixon reports that neither Mitchell nor Flinders grasses responded well. Mr. Kimmorley states that the Mitchell grasses responded very well and there was a splendid crop, though less Flinders grass appeared than during the previous season. This grass is confined to first-class black-soil country along the south-west railway line. Mr. McDonald reports that the only stand of Mitchell grasses in his area is on the Jimbour plain, where they responded very well. He remarks that there are two species of Mitchell grasses and one Flinders grass, though specimens have not yet been sent.

Mr. Monaghan reported that in the area round Dalby there is one kind of Mitchell grass (*Astrebla clymoides*) which is scarce but growing well. There is one kind of Flinders grass (*Iseilema membranacea*). It is also scarce.

From the reports received it appears that Blue grass (*Dichanthium sericeum*) is looked upon as the most valuable grass of the district. In the Goondiwindi area *Thellungia advena* is highly thought of. It is drought-resisting and after dry periods is one of the first grasses to respond to rain. Sheep are very partial to the lower leaves and cattle and horses like the top.

The outstanding herbage plants of the Goondiwindi area are Lamb's Tongue (*Plantago varia*), Wild Carrot (*Daucus brachiatus* (?)), Geranium (*Geranium dissectum*), Crowsfoot (*Erodium cygnorum*), and Trefoil (*Medicago* sp. (?)) as well as various saltbushes (*Atriplex* spp.).

Leichhardt.

Reports received from Messrs. A. Theobald, Land Ranger, Taroom; L. D. Carey, District Inspector of Stock, Emerald; W. J. Sheahan, Inspector of Stock, Clermont; H. R. Drane, Land Commissioner, Clermont; Land Rangers H. R. C. Dowden, G. R. Gray, J. D. Denshire, and F. J. Graham, Clermont; and Land Rangers J. Bergin and J. Leyden, Emerald.

All reports stated that what little Mitchell grass does grow in the district responded very well. Flinders grass also showed a good response. Three true Mitchell grasses—viz., *Astrebla lappacea, Astrebla clymoides*, and *Astrebla squarrosa*—were received from this area. In addition to these, specimens were received of two species of *Bothriochloa*.

B. intermedia is sometimes called Tableland Mitchell, and *B.* sp. aff. *intermedia* is sometimes called Forest Mitchell or Desert Mitchell. Both these grasses are regarded as excellent fodders. As they are more closely related to Blue grass it seems inadvisable to use the name Mitchell grass for them.

Iseilema vaginiflora is the only Flinders grass sent in from the district, and Mr. Bergin said that here it is not so palatable as in the western areas.

The principal grass of the Leichhardt district is Blue grass (*Dichanthium sericeum*), and this showed good growth after the 1933 rains.

In the Clermont, Emerald, and Springsure areas a large quantity of herbage grew following the winter rains of 1933. In particular, *Chenopodium auricomum,* known locally as Fat Hen, grew feet high.

Wild Carrots (*Daucus brachiatus?*); Crowfoot (*Erodium cygnorum*), and some saltbushes (*Atriplex* spp.) are fairly common in the area and are eaten by stock. Shot grass or Sago grass (*Paspalidium globoideum*) is reported as being common in some seasons and to be good fodder. Brigalow grass (*Paspalidium* sp.) is said to be an excellent grass in cleared brigalow country which has not been overstocked.

Burnett and Port Curtis.

Reports received from Messrs. E. W. Turner, Land Commissioner, Rockhampton; C. L. D. Hamilton, Land Ranger, Monto; and Land Rangers S. Thomson, P. B. Hamwood, G. Matthews, B. F. Smithers, J. M. Bean, W. G. Wood, and J. Davison, Rockhampton.

All reports stated that there was very little Mitchell and Flinders grass in the district, though the small areas which do carry Mitchell grass showed good growth. The principal grasses of the area are Blue grass (*Dichanthium sericeum*), *Bothriochloa intermedia,* and *Capillipedium parviflorum.* Kangaroo grass (*Themeda australis*) and Bunch Spear grass (*Heteropogon contortus*) are very common and are drought resistant. They are relished in their young stages. Early Spring grass (*Eriochloa* sp.) and various species of *Panicum* and *Chloris* are also looked upon as good grasses.

North Kennedy.

Report received from Mr. F. Tinsley, Land Ranger, Charters Towers.

Mr. Tinsley's report stated that only one pastoral holding in the district carries a large growth of Mitchell grass and that is Natal Downs. The Mitchell and Flinders grasses on the property responded well.

The chief grasses of the district are Spear grass (*Heteropogon contortus?*), Star grass (*Chloris* sp.), Coolah grass, Button grass (*Dactyloctenium radulans*), Kangaroo grass (*Themeda australis*), and Umbrella grass (probably *Chloris* sp.). Mr. Tinsley reported that there are no outstanding herbs in the district.

NOTES ON SOME INDIVIDUAL SPECIES.

Mitchell Grasses (Astrebla spp.).

Astrebla lappacea.—Usually known as Curly Mitchell grass. In some places called also Wheat-eared Mitchell, in others Downs Mitchell. Both these names have also been applied to *Astrebla pectinata* q.v.

Habitat.—*Astrebla lappacea* in general favours heavy black-soil flats and open downs, though in the Charleville district it is reported to be growing profusely on tight brown soil ridges.

Distribution.—Curly Mitchell grass is widespread over the western areas of the State, and in Central Queensland extends as far east as the Dawson River and Mackenzie River. Here, however, and in the Leichhardt district generally it is not very plentiful, Blue grass (*Dichanthium sericeum*) being the principal pasture grass. In the more southerly portions of the State, such as around Dirranbandi, *Astrebla lappacea* and *Astrebla pectinata* occur in approximately equal amounts, but further north *A. lappacea* becomes dominant. Strangely enough, however, in the north-western portion of Queensland, round Cloncurry, Burketown, &c., *Astrebla pectinata* apparently becomes dominant. This assumption is based upon the fact that comparatively few specimens of *A. lappacea* have been received from the area, while quite a number of specimens of *A. pectinata* have been sent in from time to time. It remains to be seen whether careful observation by a botanist will substantiate this conclusion.

Fodder Value, &c.—In most places *A. lappacea* is regarded as being the best species of Mitchell grass from the point of view of drought resistance, palatability, and nutritive value. Some observers, however, rank it as second to *A. pectinata* in this respect, others as equal to *A. pectinata* and one at least as inferior to *A. elymoides*, the Hoop Mitchell, for sheep and as inferior to *A. squarrosa*, the Bull Mitchell, for cattle. Some reports state that stock prefer it in the dry state, others that they relish it in all stages of growth.

Astrebla pectinata.—Usually known as Barley Mitchell grass or Common Mitchell grass, also in some districts as Wheat-eared Mitchell grass. In the Burke district habitat forms receive distinct common names, such as Downs Mitchell, Gulf Mitchell, &c.

Habitat.—*Astrebla pectinata* grows in somewhat the same situations as *A. lappacea*, though in the Charleville area it is reported as being more partial to loose cracky country. It is common on heavy black-soil flats and open downs. Sometimes it occurs in low-lying country associated with Bull Mitchell (*A. squarrosa*).

Distribution.—The distribution of *A. pectinata* in Queensland is somewhat strange. It is very common in the south-west, but further north appears to become less dominant. However, reports from the far north-west indicate that in that district it once more becomes the commonest species of Mitchell grass. (*See also* notes under *A. lappacea.*) *Astrebla pectinata* apparently does not extend so far east as *A. lappacea* and *A. elymoides.*

Fodder Value.—In most places *A. pectinata* is regarded as equal or but slightly inferior to Curly Mitchell (*A. lappacea*), though some reports state that it is superior in palatability and nutritive value to Curly Mitchell.

Astrebla elymoides.—Usually known as Hoop Mitchell or Weeping Mitchell, sometimes also called Curly Mitchell, though this name is more frequently applied to *A. lappacea.*

Habitat.—*Astrebla elymoides* is almost invariably associated with *A. lappacea* and *A. pectinata*, favouring the same heavy black and brown alluvial soils.

Distribution.—Hoop Mitchell is apparently the most widely distributed of the Mitchell grasses. In Queensland it occurs from the southern border to the Gulf country and from the Barkly Tableland to the Upper Dawson and Mackenzie Rivers.

Fodder Value, &c.—The general consensus of opinion appears to be that *A. elymoides* is inferior to both *A. lappacea* and *A. pectinata* in palatability and nutritive value. Nevertheless it is regarded as a valuable fodder in times of scarcity as stock eat it readily enough when the best has been eaten out of other grasses. Some observers rank *A. elymoides* above all the other Mitchell grasses. One at least stated that for sheep it was superior to *A. lappacea,* but that for cattle it was inferior to that species.

Astrebla squarrosa.—Almost universally known as Bull Mitchell. Sometimes the name Wheat-eared Mitchell is applied to this species.

Habitat.—*A. squarrosa* is usually found on low-lying, heavy black-soil flats, along watercourses, &c. It is sometimes found on the open downs, but generally favours damper situations.

Distribution.—The distribution of *A. squarrosa* is much the same as that of *A. lappacea* and *A. elymoides.* Where *A. pectinata* occurs *A. squarrosa* is frequently found growing with it, though in the more low-lying areas *A. pectinata* tends to disappear.

Fodder Value, &c.—Opinions differ as to the fodder value of *A. squarrosa.* Most reports state that stock will eat it when driven on to it by shortage of other feed, though one observer remarked that for cattle it was superior to *A. lappacea* and *A. elymoides.* As to what portion of the plant stock will eat, varied reports have been received. Some reports stated that when hungry stock will eat both the leaves and the seed-heads, others that they will eat the seed-heads only, while one at least stated that sheep will eat the flag only. The seed-heads are very heavy and the grain is large, so that there should be quite a fair amount of nutriment in them.

Flinders Grasses (Iseilema spp.).

There are four species of Flinders grasses recorded. Of these, three are found fairly frequently, the other, *Iseilema macrathera,* is very rare.

The other three species are usually not distinguished by pastoralists and consequently no distinctive common names are given to them, all being known as Flinders grass. However, for the purpose of easy reference, it has been thought advisable to give them vernacular names.

Iseilema membranacea (previously known as *I. actinostachys*), Small Flinders grass; a small species, usually straw-coloured when dry and with the spikelets or "seeds" very prominent.

Habitat.—*I. membranacea* grows on the heavy black-soil flats and open downs which carry Mitchell grasses. It is frequently associated with the Mitchell grasses though it sometimes forms almost pure stands.

Distribution.—*Iseilema membranacea* appears to be the most widely distributed of the Flinders grasses. In Queensland it has been found from the Darling Downs to the far north-west. In the more southerly localities, however, it is not nearly so plentiful as in tropical regions, and on the Darling Downs may have been introduced by sheep. However, no specimens have been received from the Leichhardt district in

Central Queensland, though *I. vaginiflora* is apparently fairly common there.

Fodder Value, &c.—All the Flinders grasses appear to be similar in fodder value. They are annual grasses which spring up quickly after rain, run to seed almost immediately, and then die off. Their principal value lies in the fact that stock are, as a rule, very fond of the dry plants which are quite nutritious. Even when the seeds have fallen and the plants have disappeared, stock will lick up the fallen seeds from the dust. A report upon *I. membranacea* from the Roma district, however, states that it is only eaten in a green state and is not relished by stock.

Iseilema vaginiflora, Red Flinders Grass.—A somewhat larger and more leafy species than *I. membranacea*. It usually turns red at maturity.

Habitat.—In addition to the heavy black-soil flats this grass has been reported as growing on stony ridges.

Distribution.—*I. vaginiflora* does not extend so far south as *I. membranacea* but seems to be the commonest species in Central and North-Western Queensland. In Central Queensland it extends as far east as the Mackenzie River and is the only species recorded from the Leichhardt district. It is also recorded from the Northern Territory.

Fodder Value, &c.—*See* under *I. membranacea*. In the Leichhardt district this grass seems to lose its palatability, and stock do not generally relish it. It has been stated that this is due to the heavier rainfall experienced in these districts.

Iseilema sp. nov. (previously known as *I. membranacea*).—A comparatively rare species for which no distinguishing vernacular name is known. It is very much like Red Flinders grass (*I. vaginiflora*) and is difficult to distinguish from that species.

Habitat.—We have few notes on the habitat of this species but it seems to favour rather damp situations such as low-lying flats, edges of watercourses, &c.

Distribution.—So far as we know this species is confined to the tropical regions of Western Queensland, though it may extend into the Northern Territory. It apparently occurs to a limited extent in the Mitchell, Gregory North, and Burke districts.

Fodder Value, &c.—Like the other species, this is regarded as an excellent fodder grass, particularly when drying off.

Blue Grasses (Dichanthium spp.).

The species of *Dichanthium* are under review by Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, consequently it is not proposed to deal with each species separately.

Blue grass is the name used throughout Queensland for *Dichanthium sericeum* and its allies, though they are also sometimes called Queensland Blue grass.

Habitat.—Blue grasses occur in a variety of situations, though usually upon good soil. They are common on alluvial flats and on downs country.

Distribution.—The Blue grasses extend from the coastal districts to the Mitchell district. In the Leichhardt district they are the chief

grasses, and in the northern portions of the Maranoa and Warrego districts are ranked very high. On parts of the Darling Downs Blue grasses are also fairly common. Blue grasses are found along the coastal strip, though they are not very important pasture grasses except in the Rockhampton-Monto area.

Fodder Value, &c.—All reports stated that the true Blue grasses are palatable and nutritious, though not very drought-resistant. In the Leichhardt district, Blue grasses are the dominant species and are eaten in preference to anything else.

Many reports stated that Blue grasses tend to disappear under heavy stocking in much the same way as Kangaroo grass (*Themeda australis*). This disappearance under stocking may account for the restricted range of the Blue grasses.

Some Allies of the Blue Grasses.

Bothriochloa intermedia (*Amphilophis intermedia*), Forest Blue Grass.—A number of local names have been applied to this grass including Rare Blue grass, Large Blue grass, Dawson Blue grass, Tableland Mitchell, and Forest Mitchell. None of these are particularly appropriate so it has been decided to call it Forest Blue grass.

Habitat.—*Bothriochloa intermedia* usually favours good soil, though it occurs on sandy country and gravelly ridges. It is commonly found on open forest country and on open downs as well as alluvial flats. In the Moreton district it is frequently found along railway embankments, cultivation headlands, &c.

Distribution.—*Bothriochloa intermedia* is common in the coastal districts of Queensland and has been recorded from as far north as Mount Molloy. It extends as far west as parts of the Maranoa district and is also abundant in the Leichhardt district, round Clermont, Emerald, and Springsure.

Fodder Value, &c.—Reports received state that this grass is much relished by stock and is very nutritious. It is also fairly drought-resistant when once established and seems altogether a desirable grass. *Bothriochloa intermedia* and *Capillipedium parviflorum* are reported as being the principal grasses of the Rockhampton, Monto, and Gladstone districts.

Bothriochloa sp. aff. *B. intermedia,* Desert Blue Grass.—This species, which has not yet received a distinctive botanical name, is called Desert Mitchell in many places and Forest Mitchell in others. However, it seems advisable to restrict the name Mitchell grass to members of the genus Astrebla, so it is proposed to call this species Desert Blue grass.

Habitat.—In the Leichhardt district this grass is reported as growing upon all classes of country from good black soil to desert. Further west it favours the desert country.

Distribution.—Desert Blue grass has a rather restricted distribution in Queensland. It is found in Central Queensland, round Emerald and Clermont. Further west it has been recorded from Lochnagar, near Barcaldine, and from Longreach. In the Burke district specimens have been collected near Cloncurry, though it is not known in what type of country it was growing.

Fodder Value, &c.—In the Clermont district, where it is usually called Forest Mitchell, this is regarded as one of the best grasses. It is

very drought-resistant and is one of the first grasses to show up green after rain. Reports state that it is fairly nutritious and that stock relish it. After hardening up on it they work nearly as well as on artificial feed. It is reported, too, that frost causes it to become sour.

Eulalia fulva, Brown Top, also sometimes known as Sugar grass, and Red or Bastard Mitchell. It is allied to Blue grass but the seed-heads are dark-brown in colour.

Habitat.—*Eulalia fulva* favours low-lying country such as gilgai holes and Coolibah flats. It is generally found on good soils.

Distribution.—Brown Top is very widely distributed in Queensland, and specimens have been received from all parts of the State except the south-eastern corner and the Cape York Peninsula.

Fodder Value, &c.—Most reports state that *Eulalia fulva* is quite a useful grass. It is drought-resistant, palatable, and nutritious but, like most of its allies, is susceptible to frost.

Capillipedium parviflorum, Scented Golden Beard; also known as Golden Scented Beardy and Scented Top.

Habitat.—Found commonly in forest land and on alluvial land. It is also very abundant on railway embankments, cultivation headlands, and in other places where the ground has been disturbed.

Distribution.—*Capillipedium parviflorum* is seen at its best in coastal districts, and is common all along the coastal strip of Queensland. In the Port Curtis district it is particularly abundant.

Fodder Value, &c.—Glowing reports upon this grass have been received from the Rockhampton district, where it is regarded as one of the best of the native grasses. In other districts it does not seem to have attracted particular attention.

Miscellaneous Grasses.

Heteropogon contortus, Bunch Spear grass; also known as Black Spear grass and Spear grass.—When mature the seed heads twist together into bunches, giving the plant quite a characteristic appearance.

Habitat.—*Heteropogon contortus* is common in forest land, though it does encroach upon black-soil flats. It is frequently found on old cultivation paddocks.

Distribution.—Bunch Spear grass is widely distributed over Eastern Queensland. It is not found in the western districts.

Fodder Value, &c.—When young, *Heteropogon contortus* makes excellent feed, but after the seed-heads appear it becomes somewhat dangerous. The "seeds" are very sharp and are capable of penetrating the skin of animals. This grass also makes very good "chop-chop" and could be used successfully as a hay crop.

Chloris spp., Star grasses, Windmill grasses, or Blow-away grasses. —There are a number of species of Chloris native to Queensland, the four most important from a pastoral point of view being *Chloris divaricata, Chloris truncata, Chloris ventricosa,* and *Chloris acicularis.* No specific common names are applied to these.

Habitat.—Chloris grasses are found in almost all types of soils and in a variety of situations.

Distribution.—Star grasses are widely distributed in Queensland from the interior to the coast. They are of particular importance in the Maranoa district, where they are regarded as some of the best grasses available.

Fodder Value, &c.—The Chloris grasses are palatable and nutritious, and are relished by stock. They run to seed very quickly, but form good bottom growth, which is extensively eaten by sheep. Under heavy stocking, *C. divaricata* and *C. truncata* do not disappear, but tend to spread and form a sward. For this reason they are particularly valuable. Their only disadvantage is that they do not provide a very great bulk of feed.

Paspalidium spp.—This genus contains the Brigalow grasses, Warrego grass, Shot grass or Sago grass, as well as numerous others which have not received vernacular names. The species are not at present well understood, so it is proposed to treat them all in one group, with the exception of Shot grass, which is a distinct and rather important species.

Paspalidium globoideum.—Shot grass or Sago grass, sometimes called Quail grass.

Habitat.—Shot grass rather favours damp situations, such as the edges of bore drains, though it is common on open downs and in box and belah country.

Distribution.—Found chiefly in the Leichhardt district, Northern Darling Downs, and Northern Maranoa. It is less common in the Warrego district.

Fodder Value, &c.—*Paspalidium globoideum* is highly spoken of as a fodder, and is reported as being fairly drought-resistant.

Other Paspalidium Grasses.—These are fairly widely distributed in Queensland and occur in a variety of situations. Most of them are highly spoken of as fodders, particularly those species which are found in Brigalow country.

Eriochloa spp.—The species of Eriochloa are also not well understood at present, so it is proposed to treat them under one heading. They are usually known as Early Spring grasses or Dairy grasses, but neither of these names seem to be particularly appropriate. In the Southern Maranoa they are called Coolah grasses, but in New South Wales this name is applied to *Panicum prolutum.* The genus *Eriochloa* is fairly widely distributed in Queensland, and most of the species have excellent reputations for palatability and nutritive value. Some of them resist drought and stocking well, and when once established should be quite valuable pasture plants.

Dactyloctenium radulans, Button grass.

Habitat.—Common on the better classes of soil, such as black-soil plains and open downs.

Distribution.—Button grass has a wide distribution in Western Queensland, and extends from New South Wales to the Gulf.

Fodder Value, &c.—Button grass is regarded as an excellent fodder. It responds very rapidly to light rains, and affords a certain amount of forage for stock until it dries off. When it dries off the seed heads are eaten. It is an annual grass.

Themeda australis, Kangaroo grass.

Habitat.—Kangaroo grass grows upon almost all classes of soil and in a variety of situations. It is especially common in railway enclosures.

Distribution.—Kangaroo grass is very widely distributed in Queensland, though it has disappeared under stocking in many localities.

Fodder Value, &c.—When young, Kangaroo grass seems to be quite good fodder, but it becomes harsh and unpalatable when mature. In some localities it is regarded as a wormy grass. Under stocking Kangaroo grass disappears very quickly.

Brachyachne convergens, Star grass, also sometimes called Wiry Star grass.

Habitat.—Common on black-soil plains, in depressions, along creek banks, and on river flats.

Distribution.—*Brachyachne convergens* is common in the Leichhardt district and along the Great Northern Railway. It is also abundant in the Gulf country.

Fodder Value, &c.—Though Star grass is very abundant, it does not seem to be eaten by stock to any great extent. From Hughenden it has been reported that stock will not eat it when green, but are fond of it when drying off. Reports from Cloncurry stated that it is a very valuable fodder grass, and is one of the best grasses on the Lower Cloncurry and Leichhardt Rivers.

There are many more grasses of minor importance, but these are too numerous to be dealt with here.

Herbage.

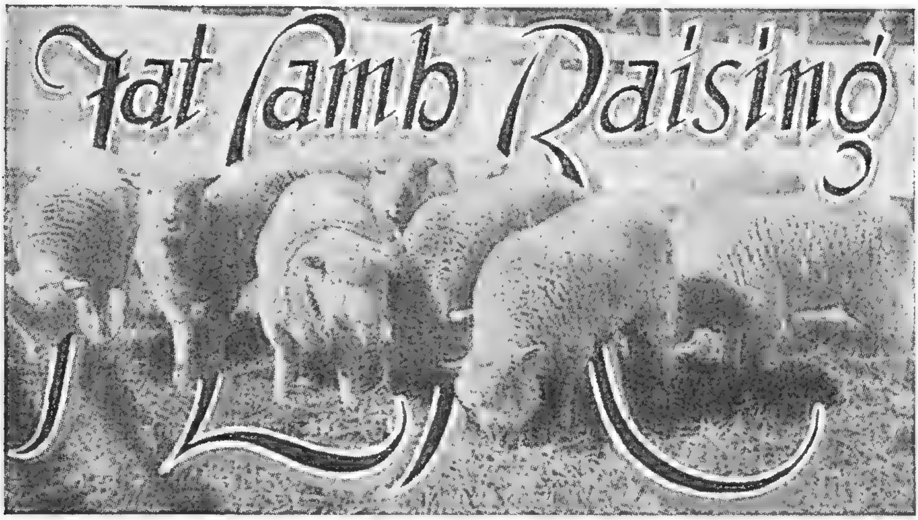
Herbage plants, particularly Saltbushes, are very important fodder plants in the pastoral areas of Queensland, and during 1933 the growth of herbage in some parts of the State was phenomenal. This was due to the winter rains, which, it is reported, always bring up large crops of annual herbage plants.

The most important herbage plants are the Saltbushes (*Atriplex* spp.) and their allies. A number of these are perennials, and provide feed all the year round, even when the grasses have disappeared. They are very drought-resistant. Some of the species are annuals.

Red Burr (*Bassia echinopsila*), a plant of the Saltbush family and closely allied to Galvanised Burr (*Bassia Birchii*), is common in parts of the Maranoa district, and is regarded as an excellent fodder. Some of the Roley-poleys (*Salsola Kali* and various species of *Bassia*) are also looked upon as good forage plants. Blue Bush (*Chenopodium auricomum*) and other species of *Chenopodium* and *Rhagodia* are generally regarded as quite good fodders.

Apart from the Saltbushes and their allies, the most important herbage plants seem to be Pigweed (*Portulaca oleracea*), Crowsfoot (*Erodium cygnorum*), Geranium or Wild Parsnip (*Geranium dissectum*), Wild Spinach (*Tetragonia expansa* or *Trianthema decandra*), Emu grass or Wild Lucerne (*Psoralea tenax*), various clovers and Medics (*Medicago* spp.), and Lamb's Tongue (*Plantago varia*). Nut grass (*Cyperus* sp.) is also highly spoken of in parts of Southern Queensland, and Nardoo (*Marsilea Drummondii*) is looked upon favourably in some quarters.

The list of herbage plants could be considerably extended, but those quoted above seem to be the most important.



By JAS. CAREW, Senior Instructor in Sheep and Wool.

THE fat lamb raising scheme, inaugurated by the Minister for Agriculture and Stock a little over twelve months ago, has proved most interesting and satisfactory. The object of the scheme is to foster this important branch of the pastoral industry, and this is done through the co-operation of the Department of Agriculture and Stock with the sheep farmers with whom rams were placed by the department.

The season over the Darling Downs, where eighty rams were allotted to thirty different farmers, has been fair to good, with the exception of a dry period during spring and early summer. The farmers selected had previously been running sheep in conjunction with agriculture, many of which had rams of British breeds other than those allotted by the department, and these were included in the experiment for purposes of comparison.

The first mating proved very satisfactory, and resulted in 2,110 lambs being marketed at Cannon Hill fat stock saleyards under the usual selling conditions.

A Classing Difficulty.

Selecting the lambs from the respective breeds and classing them correctly in separate pens is one of the difficulties met with. This, in most cases, is due to the fact that the numbers were not sufficiently large to separate according to breed or cross, and then class to size and quality. Lambs classed for breed and later for type, condition, and size in all cases sold more satisfactorily than the crosses from different breeds which had been mixed and penned together.

During the early stages of these experiments, many lambs were forwarded which showed unevenness in age, size, and condition; but as the experiments progressed, a distinct improvement in selection was shown, and most of the lambs were put on the market in even lines, showing good to prime condition before reaching the age of five months.

Weighing Test.

As the weights of lambs could not be conveniently secured from the purchasers, only one weighing test was conducted during the season.

This test was organised in co-operation with the owner, Mr. S. G. Cooper, Warrabah, Karara, and his selling agent, Dalgety and Company, Brisbane. The lambs were bred, fattened, and forwarded to the Cannon Hill saleyards by the owner, Mr. Cooper. The reason for carrying out the test was to secure data in checking up on the wastage of lambs from the time they leave the pasture to the time they are auctioned at market.

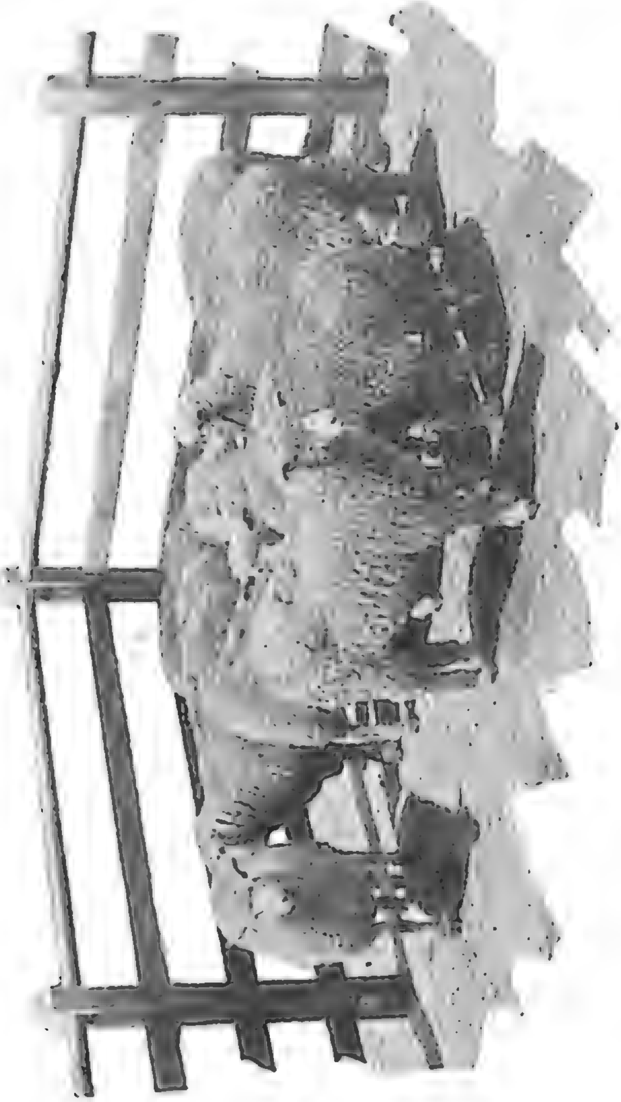


PLATE 149.

Pen of lambs of Southdown-Corriedale Cross, bred at Warrabah, Karara, Darling Downs, Queensland.

Three lambs, 4½ months old, were selected for the purpose and weighed on the holding on Saturday morning, 15th December, and again at Cannon Hill on Monday morning, 17th December, just prior to being auctioned, with the following results:—

Lamb No. 1, Romney Marsh-Corriedale cross, branded red C2C on back—

Net live weight on holding	69 lb.
Net live weight at saleyards	64 lb.
Net loss in live weight	5 lb.

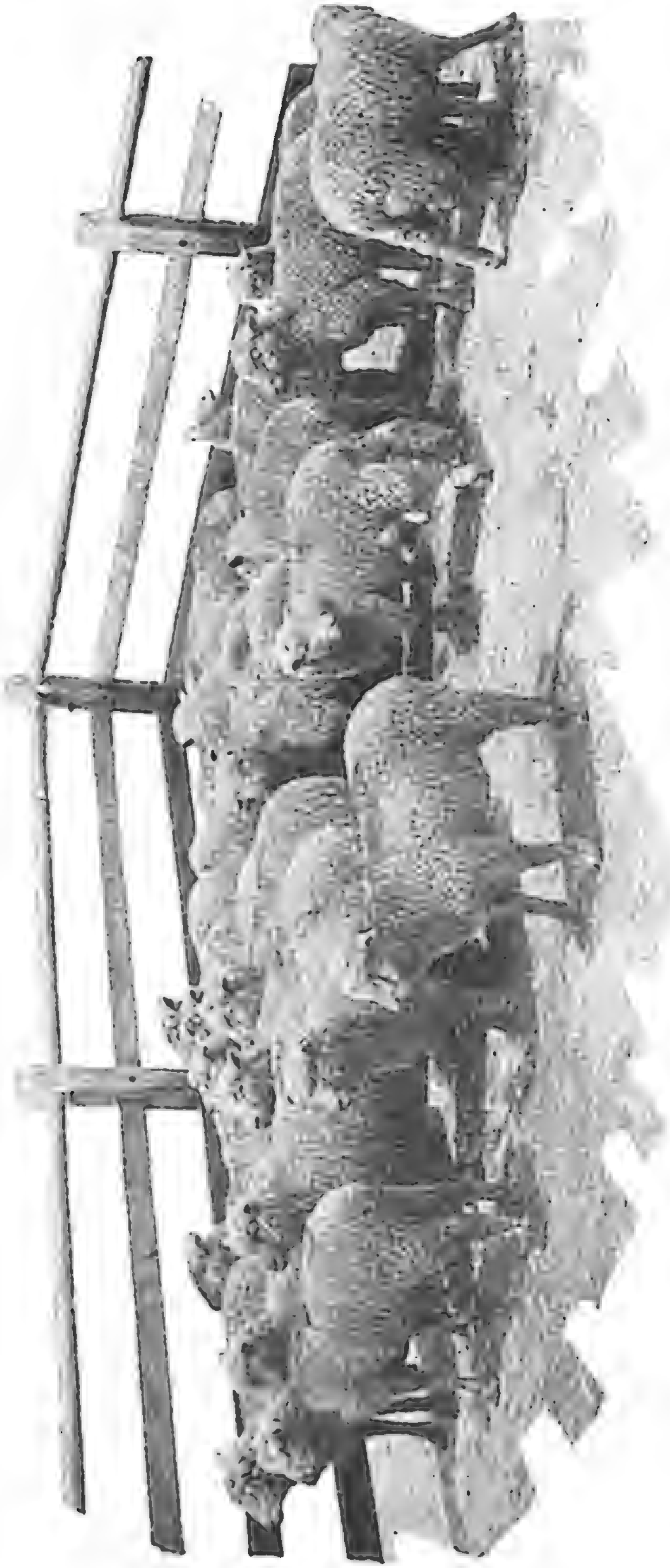


PLATE 150.
Southdown-Merino lambs bred in the Clifton District, Darling Downs.

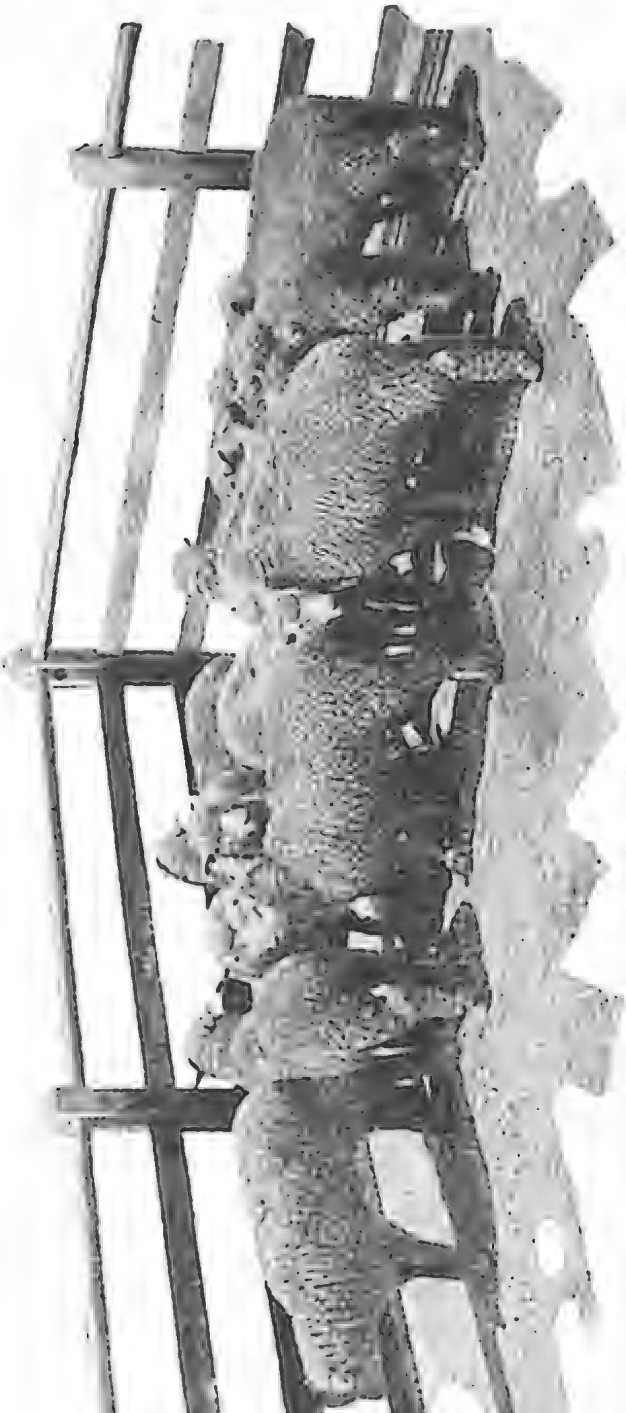


Plate 151.

Southdown-Corriedale lambs at 4½ months bred by S. G. Cooper, Warrabah, Karara.

Lamb No. 2, Southdown-Corriedale cross, branded red CC—

Net live weight on holding	71 lb.
Net live weight at saleyards	66 lb.
Net loss in live weight	5 lb.

Lamb No. 3, Southdown-Corriedale cross, branded C—

Net live weight on holding	73 lb.
Net live weight at saleyards	67 lb.
Net loss in live weight	6 lb.

This lamb was again weighed at 6 p.m., just prior to slaughter. Following are the results:—

Net live weight	66 lb.
Weight of offal and blood	17 lb.
Weight of skin, head, and feet	12 lb.
Weight of dressed carcass	37 lb.

Five breeds of rams were purchased and distributed, and the results of sales from the progeny of these and other rams included for comparative purposes are as follows:—

Number of Sales.	Number of Lambs.	Total Value.	Highest Price.	Lowest Price.	Average.
		£ s. d.	s. d.	s. d.	s. d.
		BORDER LEICESTER CROSS.			
15	965	889 10 6	24 0	12 3	18 5
		SOUTHDOWN CROSS.			
15	474	424 12 0	24 0	11 0	17 11
		DORSET HORN CROSS.			
12	440	376 4 9	21 0	13 0	17 1
		ROMNEY MARSH CROSS.			
2	18	14 14 3	17 3	14 0	16 4
		LINCOLN CROSS.			
6	182	134 17 9	17 6	12 0	14 9
		SHROPSHIRE CROSS.			
1	31	29 9 0	19 0	..	19 0

Total, 2,110 realised £1,869 8s. 3d.

Average all lambs, 17s. 8d. per head.

The Shropshires were in only one sale, and should, therefore, not be noted for purposes of comparison.

Sheep Licks.

By J. L. HODGE, Instructor in Sheep and Wool.*

IT is a fact to be very much regretted that the sheep pastures of Queensland have, in the last twenty-five years, become depleted owing to the eating out of many of the indigenous grasses. Overstocking and drought conditions are to a large extent accountable. Add to this the fact that most Australian pastures are, under natural conditions, deficient in phosphates, and the question arises, apart from the restoration of grasses, what can be done to help the stock in these circumstances? The answer is to be found in the supply to sheep of prescribed licks. The use of ingredients composing a lick should be determined by the lack of essential minerals in the feed and water, as found by analysis. For this reason it will readily be seen that even a good lick as far as its contents are concerned may be misapplied where the proved deficiencies in one district are found to be different from those of another.

Under ordinary average conditions the use of a lick should not be necessary for more than six months of the year, although some graziers contend that it pays to give the sheep access to the materials all the year round. Most benefit is to be derived from the use of a lick during the periods of hard winter feeding or when the sheep are on scrub.

Sheep should not be allowed to become poor in condition before supplying the lick; the period, therefore, when a lick is most profitable will be indicated more by the feed and weather conditions than by the condition of the flock.

Essentials of a Good Lick.

The chief essential is phosphoric acid (P_2O_5), and this may be supplied by the use of Nauru phosphate finely ground, sterilized bone meal, or "Calphos," an excellent product put up by the Queensland Meat Board. This material has everything to recommend it. It is rich in phosphoric acid and is carefully ground. It also contains a protein. In the past we have been sceptical when recommending sterilized bone meal because of the fact that the price was sometimes prohibitive and the supply was not sure. In the case of "Calphos" I am assured that supplies are quite sufficient to meet the demand, and at the price quoted —£9 per ton—the material is to be recommended. Di-calcic phosphate has lately come into prominence as an ingredient in a sheep lick. It is certainly more easily assimilated than Nauru phosphate, but the price is very high in comparison. Judged from all points of view I prefer "Calphos" or sterilized bone meal, both of which contain a protein in addition to the phosphoric acid. We have had marked success during the past few years through adding a protein to the lick, especially one prescribed for use during periods of drought, when a lick may be relied upon to be of most benefit. Linseed meal, cotton seed meal, peanut meal or wheat meal may also be used. On the whole I prefer the linseed meal.

The question of the quantity of salt to be added to a lick depends entirely upon the quantity to which sheep have access from other sources. If the water, for instance, is saline, the quantity of salt used would depend on the quantity of salt in the water. The more salt found the

* In a broadcast address, arranged with the Australian Broadcasting Commission, from Radio Stations 4QG, Brisbane, and 4RK, Rockhampton.

less would be prescribed in the lick. In some cases it would be wrong to use any salt at all.

A small quantity of sulphate of iron may be used with advantage in all cases. Its action is tonic. Epsom salts are invaluable when used in proper quantities, and these may be greatly varied to suit circumstances. Generally speaking, the harder the feed the greater the quantity of Epsom salts. Molasses may be used in sufficient quantities to bind a lick. Although its feeding value is extremely low it has other advantages which recommend it. Apart from binding a mixture it is appetising and laxative.

When recommending the addition of a protein to a lick containing salt I always sound a note of warning with regard to ewes halfway through the period of gestation. The danger is that the protein may tempt the ewe to take too much salt, with the result that twin sickness or lambing disease may occur. In these circumstances, therefore, it is advisable to take out a great proportion of the salt recommended under ordinary conditions. This applies to the ewes as described. The dry portion of the flock may have the ingredients as mentioned hereunder at any time.

In the past it has been considered necessary to use a certain proportion of iodine in the form of potassium iodide in a lick. It is now thought that this may be done away with in Queensland, as its usefulness has not been proved, and the material is highly expensive.

Variation in Lick Quantities.

The quantity of lick necessary to sheep varies. Old ewes with lambs at foot require more than dry sheep. Likewise, young growing sheep of either sex should have more than mature sheep. On an average sheep should consume lick at the rate of 2 oz. per head per week. At £9 per ton the approximate cost of the lick recommended herein works out roughly at 1d. per head per month.

Feeding a Lick.

The practice of feeding a lick to sheep in open troughs is not to be encouraged. It is wasteful. Besides the risk of loss by rain the flocks foul the mixture, making it eventually unfit for consumption.

A lick feeder is recommended by the Department. It consists of a "V"-shaped trough with a hinged and covered top. There is an aperture at the bottom of the trough which automatically releases the lick. A lick board sufficiently broad for the purpose is attached to the stand about an inch and a half below the opening and at a serviceable height from the ground. A beaded edge is supplied to save unnecessary waste.

Registration of Licks Compulsory.

Legislation these days makes it compulsory for proprietary vendors to register licks with the Department of Agriculture and Stock and to attach a label to each package setting out the contents. Graziers should be careful to see that this is done. There are many good proprietary licks on the market, but care in the choice of one should be exercised before purchasing, as it does not follow that the same pastoral deficiencies would be found in different districts.

During bountiful seasons the need for a lick decreases. This is accounted for by the fact that the pastures themselves supply the sheep

grazed on them with the necessary minerals and proteins which latter are especially plentiful with young feed.

Mineral deficiencies are especially noticeable in natural pasture grasses during the winter months, hence the recommendation for the use of the lick during this period.

It was fairly generally accepted as a fact some years ago that in the matter of salt sheep themselves were the best judges of how much to take. Those days are past, and we know now that there is a grave danger in the feeding of too much of this ingredient. For general purposes I recommend a lick composed of the following ingredients:—

"Calphos," sterilized bone meal, or Nauru phosphate	40	parts
Salt, butchers' quality	40	„
Sulphate of iron	4	„
Epsom salts	4	„
Linseed meal, cotton seed meal, maize meal, wheat meal	12	„

The whole to be bound with sufficient molasses for the purpose.

The whole or any of these ingredients may be altered to fit certain circumstances, and with that object in view it is necessary that the grazier should learn the properties of the materials used.

Calphos, sterilised bone meal, and Nauru phosphate all contain that important ingredient, phosphoric acid (P_2O_5), an absolute necessity to the health of all paddock-fed sheep. "Calphos" and sterilized bone meal contain, in addition, a protein which is lacking in Nauru phosphate. It is for that reason that I recommend their use.

Salt is in most cases included in the lick, but, as previously indicated, its use should be greatly restricted where the water is saline or in the case of ewes in lamb.

Sulphate of iron is a tonic, and its use may be freely availed of in small quantities as prescribed in all licks.

Epsom salts are used as a laxative, and here again the quantity may be largely altered, if necessary, to comply with special circumstances. It takes much more Epsom salts than is generally recognised to purge a sheep, and the quantity given in the lick herein may safely be doubled should the necessity arise without doing the sheep any harm.

I advise graziers to have on hand a supply of the ingredients mentioned with the object of mixing the lick on the property. If it is preferred to have the lick ready mixed several of the firms dealing in these materials will, at a reasonable cost per ton, mix the lick to the desired prescription if the ingredients are purchased from them.

I strongly advise graziers to give this matter of an economical lick more attention. That it is profitable is undoubted, and any expense having due regard to economy which makes for the health of the flock is returned to the grower in overflowing measure.

SIX-SIDED PADDOCKS.

To calculate roughly the area of a six-sided block—for the purposes, say, of a ringbarking contract—add together the length of all the sides in chains. If the shape of the block is regular—with about as much breadth as length—add half as much again. If the length is about twice the breadth, add nothing. Divide the result in chains by 10 to get the area in acres.

Dentition of the Pig.

E. J. SHELTON, Senior Instructor in Pig Raising.

IT is a condition of entry of live stock at agricultural shows, and also sometimes in carcass competitions, that the age of the animal be stated as at a certain specified date. In Queensland and Victoria the councils of the principal agricultural societies have provided, in order to avoid as much trouble as possible, to have the age of all pigs entered calculated to date of judging. For entry at the Royal Easter Show, Sydney, the regulation governing age provides that the age of all pigs is to be calculated from the birth date shown in the litter registration in the herd book to the date of judging at the annual show. This certainly is a great advantage, and is emphasised as worth emulation at other shows, from the standpoint of the exhibitor, judge, and the general public.

It is customary also at these shows to provide that the society's veterinary surgeon's decision be final on matters regarding age. At Melbourne Show the special provision is included that exhibitors may be disqualified and debarred from further competition for any breach of the regulations regarding the age of exhibits.

Several years ago the Council of the National Pig Breeders' Society of England embodied in their herd books a regulation dealing with the dentition of the pig, the objective being to provide a guide for the use of show societies if, and when, the question arose as to the age of an exhibit in the pig classes. These regulations have since been amended, but power is provided for stewards, at the request of the judge, to have the state of the dentition of an animal examined by a competent authority, when, if the decision of this authority indicates that the age of the pig as stated does not agree with the dentition tests, the stewards may report to the council with a view to having the animal disqualified. It has not been necessary to do this actually, except on rare occasions, at Australian shows, but a knowledge that a dentition test might be applied may act as a deterrent to breeders tempted to put the age "back a bit" in their show entry.

Thus the period of cutting of the teeth and the arrangement of the teeth in the mouth of the pig becomes an important subject, although inspection of the mouth of the pig is carried out with difficulty, and may not be relied on to the same extent as it is in the case of the horse (in particular), in which correct age is of great value. The age of the horse has for many generations been estimated by the state of dentition at time of examination.

The subject is again emphasised for the reason that at practically every show, especially the larger annual shows, the question of an animal's age becomes a most important one where competition is keen, and perhaps may be a deciding factor. Unfortunately, it sometimes happens that there may be expressed grave doubts as to the real age of any particular competing animal.

It is not claimed that the test of dentition as applied by the official veterinary surgeon will settle all arguments, but it often happens that expert opinion goes a long way towards giving satisfaction. In that sense, a knowledge of the subject will be of value to readers interested in

the exhibition of stud pigs, especially those between the ages of three and twelve months, the ages at which most of the variation of opinion occurs.

It must be remembered, of course, that the dentition of the pig—the development and growth of the teeth—is very largely influenced by the early, late, or retarded development of the animal. Hence the dentition test should never be considered as more than a fair guide to the real age; in fact, conditions in regard to feeding, handling, and exhibition vary so greatly that it is doubtful whether a dentition test would be regarded as legally binding on the party concerned. There is, however, a desire on the part of many breeders for some reliable information on this subject of the teeth as a guide to the correct age; hence these notes.

The Teeth of the Pig.

In its mature form the pig has forty-four teeth, including six incisors and two tusks on the upper jaw and six incisors and two tusks on the lower jaw. The permanent teeth in the animal's mouth are:—The middle pair of incisors, termed the centrals; the two incisors on each side of the centrals, called laterals; and the two outer incisors, called corners.

The incisors are the single or biting teeth which, as stated, occupy the front part of the jaws. The tusks are the long pointed teeth on each side of the upper and lower jaw behind the corner incisors, while the molars are the double or grinding teeth placed at the back of the jaw. There are, therefore, twelve incisors, four tusks, also referred to as canine teeth, four pre-molars, and twenty-four molars, six on each side of the upper and lower jaw. The tusks in the male are much better developed than in the female.

At birth the pig has eight teeth—four in each jaw—two corner incisors and two tusks. These are small pointed needle-like teeth; the tusks are dark in colour. It is advised to nip off these sharp, needle teeth if the suckers fight and tear the sow's teats.

The milk teeth are the temporary first set of teeth; they are small, white in colour, and, in due course, are replaced by the permanent teeth.

The following is the state of dentition in pigs which would be considered as a guide in indicating that the animals exceed the age specified below:—

Six Months.—Pigs having any one of their corner permanent incisors cut will be considered as exceeding this age.

Nine Months.—Pigs having their permanent tusks more than half up will be considered as exceeding this age.

Twelve Months.—Pigs having their central permanent incisors up and any of the three first permanent molars cut will be considered as exceeding this age.

Fifteen Months.—Pigs having their lateral temporary incisors shed and the permanent appearing will be considered as exceeding this age.

Eighteen Months.—Pigs having their lateral permanent incisors fully up will be considered as exceeding this age.

Age.	Number.	Incisors. Temporary.	Number.	Molars. Temporary.	Tusks.	Number. Temp.	Number. Perm.	Number. Total.	Remarks.
Period.		Position.		Position.					
Birth ..	4	Corner ..	..	..	Temp. ..	8	..	..	This chart
1 month ..	4	Central ..	12	1st, 2nd, 3rd ..	Temp. ..	24	..	..	is after
3 months ..	3	Lateral ..	..	Permanent ..	Temp. ..	28	..	28	Banham
6 months ..	..	Permanent	4	Permanent Molars 4th Perm. Molars	Temp. ..	P.	8	36	and is fairly
9 months ..	4	4 Corner ..	4	5th Perm. Molars	4 Perm.	20	20	40	reliable
12 months ..	4	Central ..	..	..	..	16	24	40	and a quick
15 months ..	..	..	12	1st, 2nd, 3rd ..	..	4	36	40	method of
18 months ..	4	Lateral ..	4	6th	..	0	44	44	refreshing memory.

From the foregoing and from a study of the accompanying illustrations, it will be observed that there are several groups of teeth in the pig's mouth which change as the animal advances in age from birth to maturity.

In a description of these teeth, Sir G. T. Browne, in his manual on "The Pig," discusses the subject as follows:—

When dentition is perfect, the pig has six incisor teeth in the front of both upper and lower jaws—two central, two lateral, and two corner teeth. Behind the corner teeth are the tusks—one on each side top and bottom.

Between the tusks and the molar teeth there are usually four small teeth which are described as pre-molars, one on each side of both jaws; and twenty-four molars, six on each side of the upper and lower jaws.

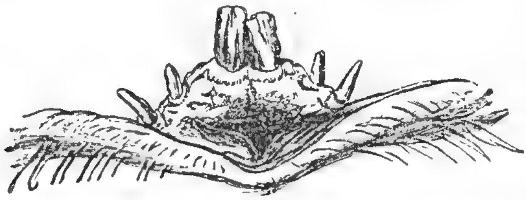
Temporary and permanent incisors agree generally in number, form, and position, but the temporary molars are only three in number on each side of the upper and lower jaws, and the third molar has three cusps instead of two. The temporary tusks are much smaller and more pointed than the permanent teeth which replace them, and the pre-molars are not represented by temporary teeth, but are permanent from the first. It may be observed that no difficulty is found by the experts in distinguishing the permanent incisors from the temporary organs, especially when both orders are in the mouth together. This distinction is not, however, so marked as to secure the tyro from risk of error.

At birth (Plate 152) the sharp-pointed teeth are laterally placed in each jaw, top and bottom, leaving an open space in the front of the

PLATE 152.—TEETH OF PIG AT BIRTH.

mouth. The teeth much resemble small tusks; they are really the temporary tusk and corner incisor; the temporary molars are immediately under the gum, and in the dried specimen they can be distinctly seen in their relative positions.

At one month old the three temporary molars on each side of the jaw, top and bottom, are cut, the second and third in position being well up, the first one just appearing through the gum; at the same time the two central temporary incisors in each jaw are cut, as shown in the illustration (Plate 153).



A. Incisors.

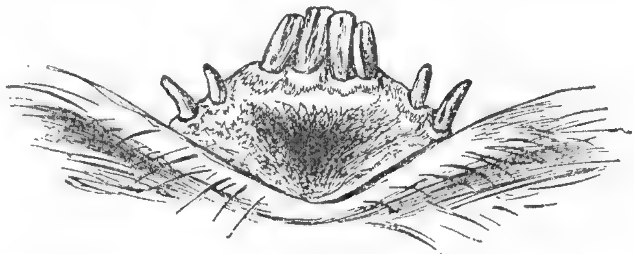
B. Molars.

PLATE 153.—INCISORS AND MOLARS OF PIG AT ONE MONTH.

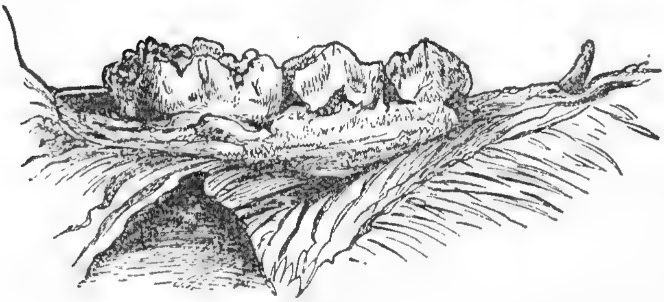
At two months old the temporary central incisors are fully developed, and there are signs of the eruption of the lateral temporary incisors, which generally pierce the gums soon after two months. The first temporary molar is now nearly level with the second.

At three months old the pig has the temporary set of teeth fully developed, the lateral incisors by this time being nearly level with the centrals. The temporary corner teeth and the tusks are further removed from each other than they were at birth, owing to the growth of the jaw. In Plate 154 the state of the teeth at three months old is indicated.

Excepting the natural growth of the jaws, in common with other parts, no changes occur which will assist the examiner in judging the age of the young pigs until the age of five months is reached. At this time there are evident signs of the cutting of the pre-molars; and the fourth molar, which is the first permanent tooth, is seen behind the temporary teeth.



A. Incisors.



B. Molars.

PLATE 154.—INCISORS AND MOLARS OF PIG AT THREE MONTHS.

The illustration (Plate 155) shows the state of the molars at the age of six months.

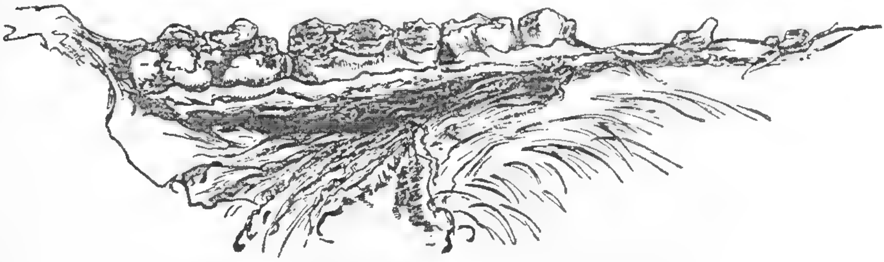


PLATE 155.—MOLARS OF PIG AT SIX MONTHS.

It should be noted that the pre-molars are not always developed, and in the same litters one or two pigs may be found occasionally in which this tooth is absent. The fourth molar is, however, remarkably regular in its appearance, and may be referred to for the purpose of solving any doubt which may arise in consequence of the absence of the pre-molars.

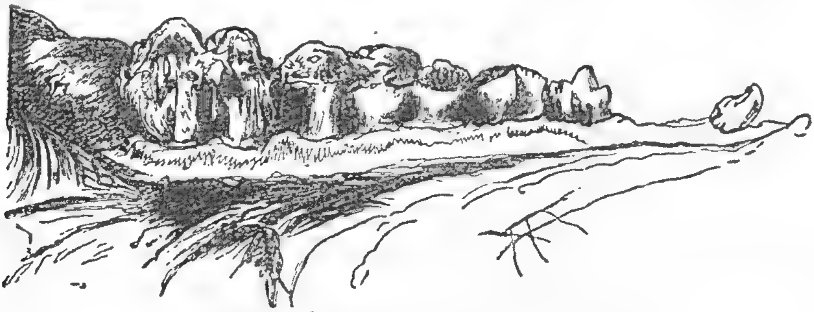


PLATE 156.—MOLARS OF PIG AT NINE MONTHS.

At nine months the corner permanent teeth are well up, and the permanent tusks may be through the gum in very forward animals at this age. The drawings (Plates 156 and 157) show the state of the teeth at nine months.

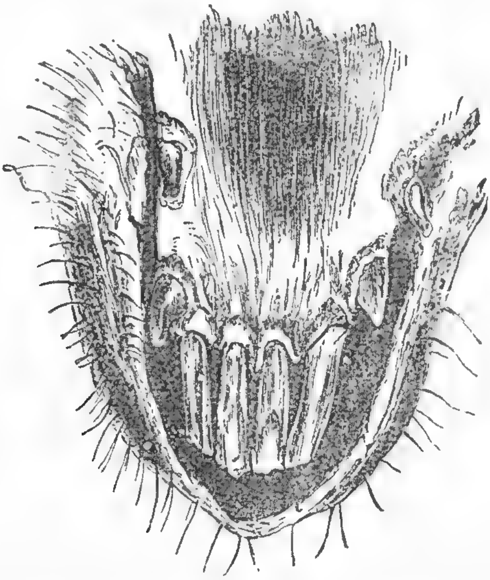


PLATE 157.—TEMPORARY INCISORS AND TUSKS OF PIG AT NINE MONTHS.

The fifth molar tooth is always cut between ten and twelve months, and its perfect eruption may be taken as evidence that the pig has reached the age of one year. In the illustration (Plate 158) the recently-cut central incisors are shown—a state of dentition which is seen only in very forward animals at the completion of one year of age.

PLATE 158.—CENTRAL PERMANENT INCISORS AND TUSKS OF PIG AT ONE YEAR (EARLY DENTITION).

Shortly after the completion of one year the three anterior temporary molars fall irregularly, and by the time the animal is fifteen months old the three anterior permanent molars are in the mouth, and may readily be known by their sharp, unworn points and their recent appearance, as shown in the next illustration (Plate 159). These teeth are very regular in their development and afford valuable evidence in cases where an opinion cannot be formed from an inspection of the incisors alone.

The next change in the dentition is the final one, and occurs between the age of seventeen and eighteen months. At this period the sixth molar, a permanent tooth, is cut, and in forward animals the lateral temporary incisors are changed for permanent teeth. In many instances the temporary lateral teeth remain up to the age of eighteen months, although they are in such cases quite loose, and very often the permanent teeth are cutting through the gum below or by the side of them; in other instances one lateral is found to be fully up and nearly level with the centrals, while the other is just pushing through the gums. The sixth

molar also is fairly well up, but the posterior part of its crown is not quite clear from the gum. These changes complete the permanent dentition of the pig, and there are no indications of the age afforded by the teeth after this period excepting such as depend on the growth and wear of the organs.

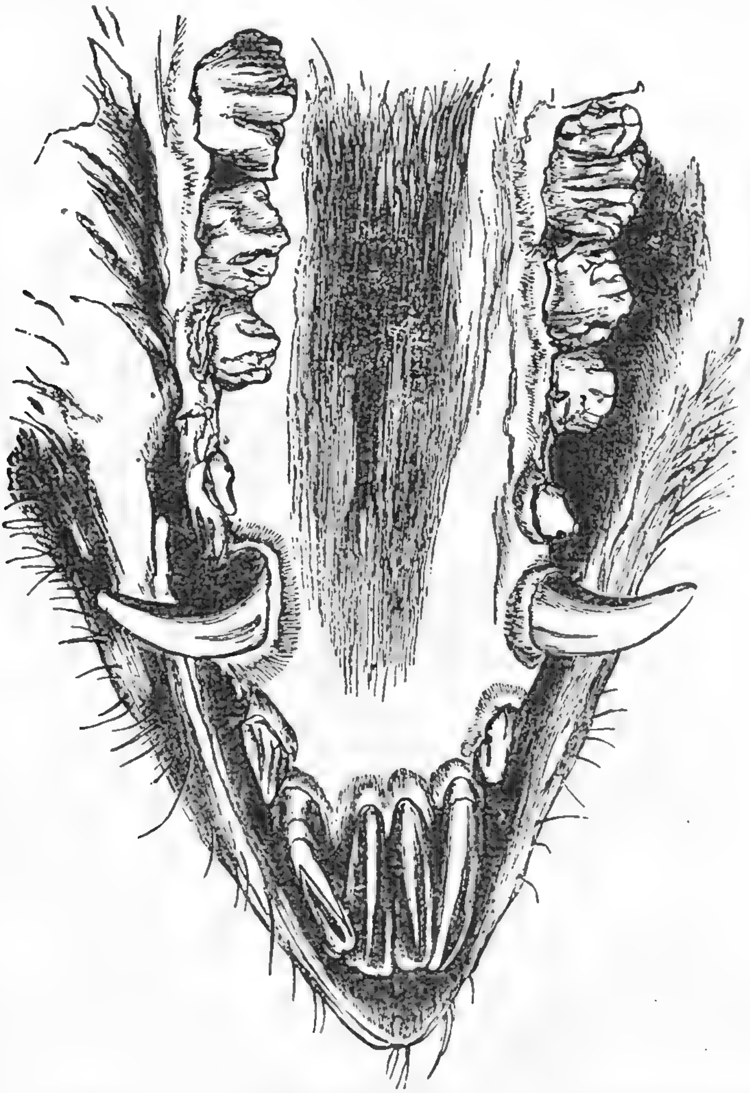


PLATE 159.—TEETH OF PIG AT FIFTEEN MONTHS; THE THREE PERMANENT ANTERIOR MOLARS RECENTLY CUT.

In Plate 160, the sixth molar is shown as it appears at the completion of the age of eighteen months.

It is very important to note that the greatest care is necessary in the inspection of the teeth of pigs which are exhibited in the class above twelve and not exceeding eighteen months old. Animals are entered at various ages from twelve to eighteen months; it is necessary, therefore, in this class to note the condition of the central incisors and the anterior molars as well as that of the lateral incisors and the sixth molar. In Plate 161 the full development of the lateral permanent incisors is shown. This state of dentition, it may be remarked, is indicative of a year and eight months.

At the age of two years, the lateral permanent incisors are quite level with the centrals, and are worn on their edges; the sixth molar now

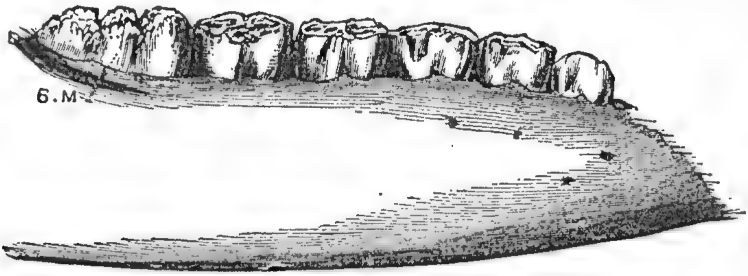


Plate 160.—Molars of Pig at Eighteen Months; Sixth Molar Well Up.

stands quite free from contact with the angle of the jaw, and indications of wear may be observed on the upper surface of the other molars. After the pig has attained the age of two years, an opinion as to the age must

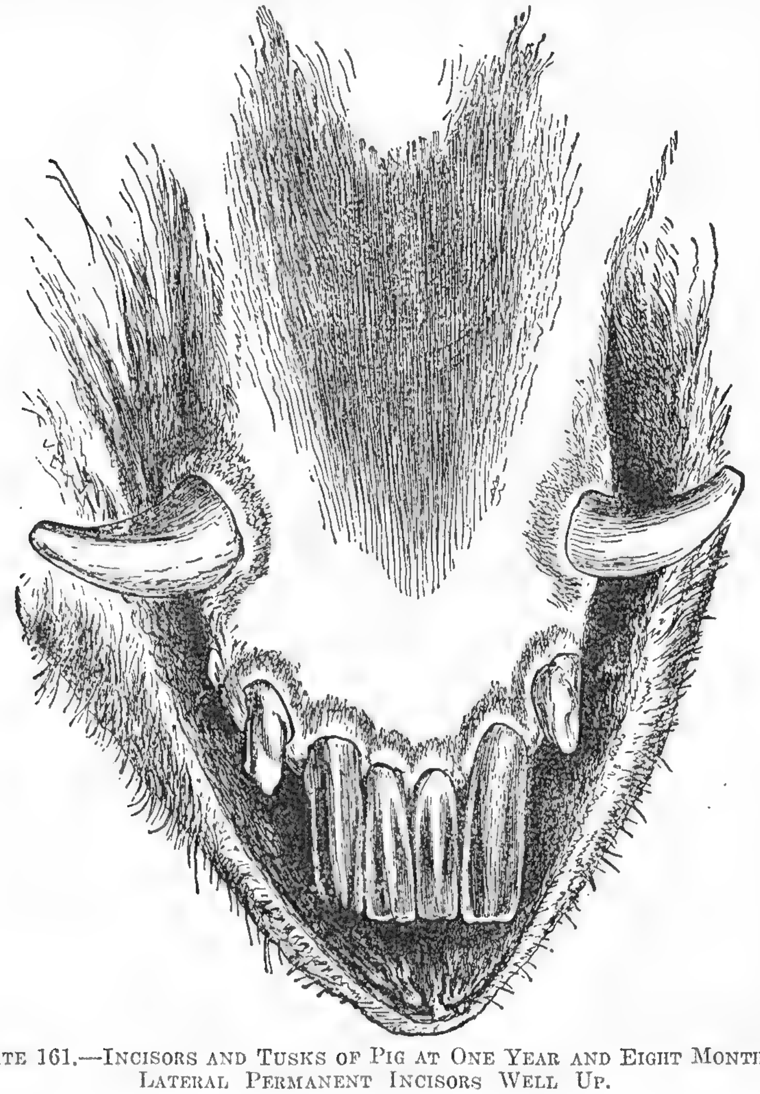


Plate 161.—Incisors and Tusks of Pig at One Year and Eight Months; Lateral Permanent Incisors Well Up.

be to a great extent speculative. The wear which the teeth undergo, the darkening of their colour, and the growth of the tusks, will afford some evidence which will assist the judgment, but there are no changes which can be referred to as indicative of the exact age of the pig after the lateral incisors and the six molars are fully developed.

PLATE 162.—A SCENE ON A FASSIFERN FARM.

LIST OF REGISTERED STALLIONS.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under "*The Stallions Registration Acts,* 1923 *to* 1934," during the year 1934-35:—

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1934-35.

Name.	No.	Age.	Description.	Owner.
Ajalon	1093	5	Brown or black	J. L. Porter, Kandanga
All Alone	1107	6	Dark chestnut	R. Ryan, Gympie
Amazing	1341	Aged	Chestnut	C. L. Schilling, Bowen
Archie	1360	Aged	Bay	H. K. McKay, Pinnacle
Banker	1302	5	Brown	M. R. Shannon, Olive Downs, Nebo
Bieryer	1279	7	Bay	M. Ryan, Linville
Bold Syce	1281	Aged	Brown	W. Yorston, Maryvale
Bonnie Error	1047	6	Brown	R. W. Gordon, Drayton street, Allora
Boonallen	1057	Aged	Black	A. B. Parker, Limevale
Brocardo	1256	6	Black	C. Campbell, Rolleston
Cantrip	1540	Aged	Chestnut	F. G. Isdell, Havilah Station, Collinsville
Centauri	1255	5	Chestnut	F. C. Lawton, care of A. G. Anderson, Hendra
Chan Lin	1098	Aged	Bay	Atherton Brothers, Proston
Cool Day	1035	Aged	Bay	Bailey Brothers, "Foxborough," Talwood
Dooville	1367	Aged	Chestnut	A. D. Shannon, Oxford Downs, Nebo
Eclipse	1300	6	Brown	John Anderson, Theodore
Emblem	1307	5	Brown	J. S. Clewley, Ubobo
Eudorburn	1104	5	Chestnut	J. D. Bowen, Torbanlea
Eulorbar	1308	Aged	Brown	Mace and Son, Toorilla
Fisherdale	1276	Aged	Bay	D. Cullen, Pampas
Gallipoli's Pride	1037	Aged	Bay	Nicholson and Biddle, Goondiwindi
Golden Love	1339	5	Bay	W. T. Wharton and Company, Collinsville
Hal Tor	1056	5	Chestnut	Mrs. S. M. Noye, Warwick
Hiban King	1309	Aged	Chestnut	C. F. Stapp and Sons, Marlborough
High Standard	1262	5	Brown	J. W. Wallace, Doncaster street, Toowoomba
Index	1110	Aged	Bay or brown	M. L. Wagner, Mount Perry
Inglestone	1054	Aged	Grey	W. R. Munro, Winton, Goondiwindi
Jolly Gozard	1362	Aged	Bay	C. Knobel, Silent Grove, Mount Pelion
Kerpad	1310	Aged	Chestnut	Gorman Brothers, Edungalba
King's Speech	1312	Aged	Bay	Beak Pastoral Co., Wilangie
Kingville	1313	Aged	Bay	A. Shannon, Saltbush Park
Kintrocket	1264	5	Brown	W. Corden, Wau, New Guinea
Koo-Wong	1314	Aged	Bay	J. Gray, "Hexham," Yeppoon
Ladallan	1315	Aged	Brown	F. J. C. Brown, Bombandy
Laurel Crown	1364	Aged	Bay	E. Hermon, Aberdeen, North Eton
Maloola Laddie	1114	Aged	Brown	E. H. Steele, Wolvi, Gympie
Matutor	1112	Aged	Bay	F. R. Jamieson, Gundiah
Mondillion	1347	6	Bay	J. J. Smith, Roma Peak, Bowen
Moonmera	1318	Aged	Chestnut	Hanrahan Brothers, Wycarbah
Mr. Speaker	1265	5	Bay	T. J. Brosnan and I. J. Moore, Ascot
Norma's Lad	1321	5	Brown	D. J. Nolan, 75 Kent street, Rockhampton
One	1345	6	Bay	Beak Pastoral Co., Bowen
Palomond	1063	Aged	Bay	Mrs. C. B. Watkins, Killarney
Perfect Light	1067	Aged	Bay	G. Amor, Noonge, Jackson
Rightaway	1268	5	Brown	E. E. D. White, Bluff Down, Charters Towers
Rivoli B.	1325	Aged	Black	J. S. Hutchison, Theodore
Salt Shrine	1269	6	Brown	Dr. O'Neill, Townsville
Sarcoe	1327	Aged	Grey	Beak Pastoral Co., Wilangie
Sasin	1370	Aged	Chestnut	R. W. Perry, Nebo
Scotch Force	1064	5	Bay	E. Farmer, Gladstone
Simercian	1348	Aged	Bay	F. E. Schilling, Bowen
Sir Dini	1069	5	Chestnut	M. Coonan, Pittsworth
Sir Hinkler	1091	Aged	Brown	F. T. W. Stokes, Mount Walker West
Sir Oxford	1366	Aged	Chestnut	A. D. Shannon, Oxford Downs, Nebo
Spearall	1271	6	Brown	P. J. Mayne, care of A. G. Anderson, Hendra
Springfield	1036	6	Bay	J. Benson, Goondiwindi
Star Deer	1274	5	Brown	W. J. Noud, Ascot
Strange Idea	1296	5	Chestnut	A. G. Anderson, Hendra
Syce Downs	1127	5	Chestnut	Burton Brothers, Kingaroy
Tabragalba Lad	1070	5	Bay	Cooper and Sons, Warra
The Askari	1044	5	Chestnut	H. W. Dight, Whetstone
Taranto	1330	Aged	Cream	T. N. House, Theodore
Trackertino	1299	Aged	Black	T. Copley, Stanley House, Esk
Tredwell	1331	Aged	Bay	A. Shannon, Saltbush Park
Truby King	1554	Aged	Bay	M. McCormack, Box 71, Proserpine
Vain Prince	1338	Aged	Brown	J. B. Shannon, Tooloombah
Waiburra	1333	Aged	Chestnut	W. Drynan, Many Peaks
Western Lad	1334	Aged	Brown	W. J. Hammond, Littlemore
Wet	1277	5	Bay	F. T. Guy, Hendra
Whittier Star	1081	6	Chestnut	H. Parkinson, Toowoomba
Woodripe	1335	Aged	Brown	J. L. Clifford, Charmwood, Lowmead
Yarrestee	1038	Aged	Brown	A. J. Boyce, Graymere
Young Maloola	1128	5	Bay or brown	P. Jeppson, Patterson, North Coast Line
Young Rattrap	1040	Aged	Chestnut	Browne Brothers, Loch Lomond, Yangan

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1934-35.

Name.	No.	Age.	Description.	Owner.
Admiral's Joker	1258	5	Brown ..	R. Roberts, Beerwah
Baron King ..	1350	Aged	Bay	J. C. Jensen, Don River, Bowen
Bay Baronet ..	1094	5	Bay	Mulholland Brothers, Gympie
Beau Ideal	1278	5	Bay	P. J. McCauley, Neurum
Black Watch ..	1065	5	Black ..	P. C. Thomas, Coraki, New South Wales
Bob	1280	5	Brown ..	A. Kunde, Hazeldean
Bonny Willie ..	1095	5	Bay	C. T. Griggs, Muan
Brave Lad	1282	5	Bay	J. F. Kowaltzke, Blenheim
British Earl ..	1096	5	Bay	G. Wilkie, Binjour, Plateau
Captain	1283	5	Brown ..	D. McCarroll, Murrumba
Captain	1284	5	Black ..	W. Jackwitz, Mount Berriman, Laidley
Captain	1259	5	Brown ..	W. G. Rudd, Mudgeeraba
Captain Pink ..	1303	Aged	Brown ..	B. Wagner and Co., Marylands
Chancellor	1084	5	Bay	S. H. Plant, Cooyar
Clinker	1074	5	Bay	A. J. Harris, Yarranlea
Clyde	1352	5	Bay	R. W. Miller, Box 198, Bowen
Clydebank	1077	Aged	Bay	Mrs. M. E. Leahy, Bon Accord, Dalby
Crown Head ..	1242	5	Bay	Florence A. Sproule, Guthalungra
Crusader	1049	6	Brown ..	L. E. and C. J. Taylor, Kooroongarra, Esk
Crystal	1305	Aged	Bay	Mace and Son, Toorilla
Daddy	1356	6	Chestnut ..	D. Hadlow, Kelsey Creek, Proserpine
Donald	1100	Aged	Brown ..	E. J. Morris, Gleneden, Humphrey
Double Top.. ..	1055	Aged	Bay or brown	C. J. Neilson, Yangan
Douglas II.. ..	1101	Aged	Bay	A. Kamholtz, Memerambi
Duke	1306	Aged	Bay	Mossman, J., Miriam Vale
Duke	1102	Aged	Bay	W. C. Hotton, Reid's Creek, Gayndah
Duke	1103	Aged	Bay	Atherton Brothers, Proston
Duke of Sunnyside	1068	5	Bay	W. F. Burge, Gomorran, *via* Goombungee
Gibson Lad ..	1083	6	Bay	W. H. Pickthorne, Chinchilla
Glenbar Square Dale Yet	1051	5	Bay	A. Jensen, Swanfels
Glen Dale	1075	5	Roan.. ..	J. F. Hayden, Shirley, Crow's Nest Line
Glenella II.. ..	1261	Aged	Bay	J. Maloney, Rathdowney
Glenmore	1066	5	Bay	F. P. Alexander, Inverai, *via* Warra
Glentyre General ..	1105	Aged	Bay	S. G. Ball, Kapaldo
Gordon Craig ..	1257	Aged	Black ..	J. Hession, Oxenford
Happy Choice ..	1260	Aged	Bay, white hairs	J. M. Smith, North Otago, New Zealand
Hustler	1355	Aged	Roan.. ..	C. W. Faust, Proserpine
Johnny Walker ..	1106	5	Brown ..	F. Hebbel, Tableland, Murgon
King Bruce III. ..	1108	5	Bay	J. J. Beetham, Deep Creek, Kingaroy
King Godfrey ..	1086	5	Bay	J. W. Rush, Dulacca
King's Hope ..	1311	Aged	Bay	B. Wagner, Marylands
Lion	1287	5	Bay	A. Langton, Cooyar
Lord Bute	1316	6	Bay	A. Shannon, Saltbush Park
Lord o' the Hills ..	1050	5	Bay	E. Hindmarsh, Lyra
Major	1111	Aged	Bay	D. Blackburn, Mundubbera
Major's Pride ..	1289	Aged	Grey ..	S. Andrew, Laidley
Marshall Intent ..	1346	6	Bay	R. Smith, Bowen
Monty	1317	5	Brown ..	S. Graham, Theodore
Nelson	1290	Aged	Bay	J. A. Montgomery, Laidley
Nelson	1045	Aged	Brown ..	G. W. F. Goodrich, Warroo, Inglewood
Nobby's Pride ..	1073	5	Bay	L. Ferguson, Nobby
Noble	1291	5	Bay	J. W. Schultz, Wheeler's Crossing, *via* Esk
Noble	1319	5	Black ..	W. J. Kelly, Banksia
Noble	1320	5	Bay	W. Carmichael, Calliope
Noble	1115	Aged	Bay	Elliott Brothers, Goomboorian
Noble King ..	1359	5	Bay	J. R. Peoples, Finch Hatton
Noble Lad	1116	5	Brown ..	J. V. Bernier, Proston
Norman	1292	Aged	Black ..	C. Griffiths, Croftby, Boonah
Orphan Boy ..	1372	Aged	Bay	J. C. Bowman, Pleystowe
Popinjay	1323	Aged	Bay	C. and S. C. Becker, Theodore
Premier's Pride ..	1324	5	Brown ..	W. Wilson, Jambin
Prince	1120	5	Bay	R. Williams, Crawford
Prince	1121	6	Bay	J. E. Bandholz, Antigua
Prince	1363	Aged	Grey ..	B. F. Hogan, Mirani
Prince Charles ..	1059	5	Bay	J. E. Roberts, Wildash, Warwick
Punch	1293	Aged	Chestnut ..	W. Webster, Kilcoy
Punch	1109	Aged	Brown ..	W. Hobson, Sandy Creek, Kilcoy
Rhubarb	1267	5	Brown ..	A. J. Drynan, Beaudesert
Rising Sun	1123	5	Bay	T. Dingle, Drummer's Creek, Mount Perry
Rob	1294	6	Bay	F. G. Zupp, Boonah
Robin Wallace ..	1124	6	Bay	W. H. O. Smith, Ceratodus
Rover	1089	6	Bay	A. J. Specht, Wellcamp
Royal Blue ..	1080	5	Grey ..	W. P. O'Sullivan, Ascot, *via* Greenmount
Royal Chance ..	1085	5	Bay	W. J. Prasser, Jondaryan
Royal Dale ..	1295	5	Bay	O. P. Kanofski, Ipswich
Samson	1326	Aged	Bay	E. J. Angel, Glengarry, Merimal
Scamp	1328	5	Black ..	H. E. Horne, Cracow
Scotchman	1343	Aged	Bay	G. J. Fischer, 86½ Mile, Bowen Line
Sergeant's Orphan	1253	5	Brown ..	E. W. Simmich, Maroon
Shepherd's Pride ..	1042	5	Bay	G. E. Crane, Elbow Valley, Warwick
Sheppard's Prince ..	1072	7	Bay	S. T. Evans, Chinchilla
Sir Douglas ..	1125	5	Bay	Honey and Braithwaite, Murgon

Draught Stallions Certificated for Life During the Year 1934-35—*continued.*

Name.	No.	Age.	Description.	Owner.
St Helen's Piper ..	1034	5	Bay	S. A. Perrett, Flinders, Fassifern Line
St. Helen's Rob Roy	1126	5	Bay	J. Newman, Alice Creek, Kingaroy
Stanmore	1060	Aged	Bay	M. B. Ruming, Upper Pilton
Star	1344	Aged	Bay	F. G. Day, Gumlu
Talgai Wallace ..	1297	5	Brown ..	W. Profke, Glamorgan Vale
Torilla	1329	Aged	Black ..	Greycliffe Estates, Rannes
Verdew	1042	5	Bay	W. J. O. Dempsey, Upper Freestone
Widgiewa Lad ..	1046	6	Bay	R. W. Gordon, Drayton street, Allora
Worawingeth Dignity	1071	5	Bay	A. F. Creswick, St. Helen's, Pittsworth
Young Monk ..	1336	Aged	Bay	Coochin Estate, Cambooya
Young Wallace ..	1063	5	Brown ..	D. Harrison, "Palestine," Muttaburra

Pony Stallions Certificated for Life During the Year 1934-35.

Name.	No.	Age.	Description.	Owner.
Billy	1353	Aged	Bay	L. W. Williams, Don River, Bowen
Bluff..	1371	6	Grey ..	A. H. Ferguson, St. Albans, Nebo
Decorum	1099	5	Bay	Honey and Braithwaite, Murgon
Dan Dooloogra ..	1351	Aged	Grey ..	J. C. Jensen, Don River, Bowen
Ding Dong	1078	5	Bay	J. C. Mann, Yarranlea
Ebony	1061	5	Dark brown..	E. Taylor, Fletcher
Eclipse	1053	5	Taffy.. ..	J. Mullins, Mill Hill, Warwick
Firelight II. ..	1252	Aged	Bay	L. Hogarth, Stonehenge
Grey Wonder ..	1041	Aged	Grey ..	W. Caton, Legume, N.S.W.
Haired	1286	5	Bay	E. G. Smith, Toogoolawah
Inchcape	1263	5	Brown ..	K. Lowe, Burpengary
Jimed	1082	6	Brown ..	Mrs. E. Pearce, 247 Hume street, Toowoomba
Little Dick	1288	Aged	Black ..	C. R. Doorey, Laidley
Little Tim	1052	5	Taffy.. ..	C. J. Lewis, Warwick
Little Tim	1079	6	Bay	F. C. Marshall, Whichello
May Duke of Penniwell (imp.)	1088	Aged	Black ..	Eva M. Sherwin, Birrilli, Brookstead
Merrybow	1039	5	Bay	A. R. Brydon, Glencoe, Yelarbon
Nigger	1058	Aged	Black ..	H. Rabbitt, Inglewood
Night Raid ..	1076	5	Bay	H. Hock, Bunya street, Dalby
Pento	1118	5	Cream ..	A. Skyring, Kinbombi
Petite's Pride ..	1119	5	Bay	A. O. Harm, Byee, *via* Murgon
Pilot	1368	6	Rebald ..	A. J. McLean, Nebo
Raisuli	1048	Aged	Chestnut ..	A. C. McDougall, Miles
Ranger	1349	Aged	Roan.. ..	D. S. Miller, Don River, Bowen
Regal Son	1122	6	Bay	L. C. Walker, Bundaberg
Saharas	1369	Aged	Bay	H. Crawford, Mount Robert, Nebo
Selin	1557	6	Brown ..	E. G. Lascelles, Proserpine
Sonny Boy	1361	Aged	Bay	W. Vicary, Finch Hatton
Sonny Watch ..	1358	Aged	Brown ..	F. S. Crease, North Side, Mackay
Tibby	1298	5	Brown ..	H. Weigel, Hatton Vale, *via* Laidley

Trotter Stallions Certificated for Life During the Year 1934-35.

Name.	No.	Age.	Description.	Owner.
Abe	1254	6	Brown ..	L. Riesenweber, Jacob's Well
All Chimes	1087	Aged	Black ..	J. C. Schweikert, Milmerran
Broadarrow.. ..	1090	5	Bay	F. T. Walker, Darriwell, Bell
Broadcast	1097	5	Brown ..	E. Ricketts, Walker street, Bundaberg
Gay Night	1285	5	Brown ..	M. Robeck, Rockside, Gatton
Hinkler	1365	Aged	Bay	J. McNamara, Homebush
McKinney's Pride	1373	Aged	Bay	Mrs. M. Ruddy, Childers
Paddy Wilkes ..	1266	5	Brown ..	M. F. Postich, Warra
Sir Beldon II. ..	1270	5	Chestnut roan	F. R. Baxter, Morningside
Wolston Hall ..	1273	Aged	Black ..	J. Campbell, Djuan

Blood Stallions Certificated for the Year 1934-35.

Name.	No.	Age.	Description.	Owner.
Ambermond ..	..	4	Bay	C. R. S. Smith, Mount Joseph, Brooweena
Arboreal	..	4	Bay	M. Ryan, Ascot Chambers, Brisbane
Ardon's Pride ..	..	3	Brown ..	W. J. Tucker, Hendra
Bachelor's Heir ..	..	4	Chestnut ..	K. Brennan, Croftby, *via* Boonah
Bachelor's Lodge ..	..	4	Bay	W. Redman, Braemar, Warra
Ben Art	..	3	Chestnut ..	Miss M. Stevens and A. G. Anderson, Hendra
Bonney Clyde ..	..	3	Brown ..	W. Gilmore, Allora
Boropolis	..	4	Brown ..	Scott Brothers, Wandoan
Brownlee	..	3	Brown ..	W. H. Smith, Ubobo
Brown Poitrel ..	..	3	Bay or brown	A. G. Cross, Ellesmere, Kingaroy
Burnlad	..	4	Chestnut ..	J. L. Cantwell, Chinchilla
Byramjee	..	4	Brown ..	F. Black, care of C. Connell, Manson road, Hendra
Dalmain	..	4	Brown ..	A. P. Gibson, Boolboonda, Mount Perry Line
Dan Scorn	..	3	Brown ..	J. McLean, Watalgan
De Letle	..	4	Bay	W. Dingle, Drummer's Creek, Mount Perry
Dennis Lad ..	..	4	Chestnut ..	G. E. Crane, Elbow Valley, Warwick
Don's Price ..	..	3	Brown ..	C. Svensen, Walker street, Bundaberg
Duinatic	..	3	Bay	J. Drinan, Wallaville
Flying Painter ..	..	4	Bay	W. T. Gillies, Cooyar
Forceona	..	4	Grey ..	R. J. Spence, Muttaburra

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1934-35—*continued.*

Name.	No.	Age.	Description.	Owner.
Gallant Blanck ..	..	3	Bay	D. C. Cameron, Le Geyt street, Windsor
Glengarry	..	3	Brown ..	W. C. Dickinson and Sons, Glengarry, Nagoorin
Glenstock	..	4	Bay	Cook and Cook, Wandoo Station, *via* Koumala
Glen's Spear ..	..	3	Brown ..	G. Cameron, Marian
Graceville	..	4	Brown ..	F. J. C. Brown, Bombandy
Guy Fawkes ..	..	4	Chestnut ..	J. P. Walsh, Mount Perry
Hastate	..	3	Brown ..	W. A. Collins, Cairns
High Gain	..	4	Brown ..	Rees and White, Surat
Jean Jacques ..	..	4	Chestnut ..	W. Bullock, Booval
Jehad	..	4	Chestnut ..	W. G. Hein, James street, Howard
Jigga Jigga ..	..	Aged	Bay	A. D. Shannon, Oxford Downs, Nebo
King Baralong ..	..	4	Brown ..	D. C. Cameron, Le Geyt street, Windsor
Layman	..	4	Chestnut ..	J. Redmond, Beaudesert
Leolita	..	4	Bay	T. J. Jennings, Greenmount
Leon D'Or	..	3	Brown or bay	C. Faircloth, Booval, Ipswich
Mane Berd	..	4	Bay	R. Devlin, Mill Hill, Warwick
Master Persse ..	..	3	Chestnut ..	E. J. Griffiths, Mount Forbes
Maxie	..	4	Chestnut ..	C. H. Gear, Bingera road, Bundaberg
Memorial	..	4	Bay	T. Pownall and Pownall, Monto
Menelaus	..	3	Brown ..	A. G. Anderson, Hendra
Mervyn's Choice ..	..	3	Bay	T. J. Turkington, Wattle Brae, Nobby
Mount Lad ..	..	3	Grey ..	A. D. Orr, Mount Irving, *via* Oakey
Oregyn	..	5	Chestnut ..	A. Adie, Post Office, Childers
Pandion	..	3	Brown ..	I. J. Moore and T. J. Brosnan, Ascot
Pastmaster ..	..	3	Brown ..	C. T. Griggs, Muan
Poitrel Lane ..	..	4	Chestnut ..	T. A. Gardiner, Eulo
Prince Orange ..	..	3	Chestnut ..	S. D. C. Rushbrook, care of Winchcombe, Carson, Charleville
Real Felt	..	3	Bay	R. Mahaffrey, Grantham
Real Flyer	..	4	Brown ..	Collins Brothers, Mount Surprise, Cairns
Repaz	..	4	Bay	A. N. Zeller, Mount Luke, Crow's Nest Line
Robemond	..	3	Black ..	R. Baker, Caboolture
Sage King	..	4	Brown ..	N. A. Hoey, Tugun
Scholar	..	3	Chestnut ..	C. Clark, New Farm
Sea Laddie	..	4	Bay	J. Cunningham, "Furmiston," *via* Wowan
Semitic	..	3	Bay	A. G. Noud, Ascot
Serewick	..	4	Brown ..	T. J. Campbell, New Moonta
Sir Bluewin ..	..	4	Brown ..	M. Brosnan, Dragon street, Warwick
Sir Force	..	4	Bay	A. G. Rowling, Texas
Sir Monarch ..	..	3	Brown ..	T. J. Jennings, Greenmount
Smilax	..	3	Brown ..	B. Buckley and J. Murphy, Moynihan street, Ascot
Soft Step	..	4	Brown ..	W. J. Tucker, Hendra
Sonny Boy	..	4	Bay	A. M. Deighton, Mooloo, Gympie
Southern Don ..	..	4	Chestnut ..	D. A. Proctor, Glen Valley, Byrnestown
St. Grafton ..	..	4	Brown ..	J. D. Kirwan, Lisson Grove, Wooloowin
Thalacre	..	4	Bay	A. F. Campbell, Columboola
Treken	..	3	Chestnut ..	S. C. Luck Freestone
Tripple Ring ..	..	4	Brown ..	J. Thompson, Cooktown, North Queensland
Utterer	..	4	Brown ..	T. J. Brosnan, Ascot
Warwickeye ..	..	4	Black ..	L. Dixon, Crescent Avenue, Hendra
Wide Bay	..	3	Bay or brown	C. Clark New Farm
Winaspear	..	3	Brown ..	C. Harsant, Radford
Wittabius	..	4	Chestnut ..	C. Bergmann, Witta
———	..	3	Bay	R. Hill and T. Pethers, Unumgar, *via* Kyogle
———	..	4	Bay	Rawdon, Briggs, and Co., Mount Perry

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1934-35.

Name.	No.	Age.	Description.	Owner.
Alexander's Pride ..	..	3	Bay	H. Alexander, Warra
Audroy Lad ..	..	3	Bay	W. Biegel, Rywung
Back Plains Silver Dale	..	3	Bay	C. E. Lack, Back Plains, Clifton (Provisional)
Banker	..	4	Bay	G. E. Bassingthwaighte, Jandowae
Baron Fancy ..	..	3	Bay	S. Otto, Emu Creek, *via* Crow's Nest
Baron Favour ..	..	4	Bay	J. M. Newman, Caboolture
Baroona Musketeer	..	4	Chestnut ..	G. Mussig, Pomona
Beau Ideal	..	3	Bay	A. H. Greenup, Bancroft, *via* Gladstone
Ben	..	4	Bay	J. Tennyson, Chinchilla
Ben	..	4	Bay	V. K. Trott, Reid's Creek, Gayndah
Ben Hur	..	4	Black ..	M. MacDonnell, South Side, Gympie
Black Prince ..	..	3	Black ..	J. Simmons, Coo-ee-ville, Milmerran
Black Prince ..	..	4	Black ..	D. W. Bell, Beebo
Blaze	..	3	Bay	E. Armstrong, "Oakwood," Bell
Blaze Dale	..	4	Brown ..	A. W. Law, Kuttabul, Mackay
Blossom's Pride ..	..	3	Bay	F. P. Alexander, Inverai, *via* Warra
Bluff Wylie ..	..	4	Bay	L. Schneider, Boonah
Bob of Abbotsleigh	..	3	Bay	Estate of W. C. Collins, Rosedale
Bold Boy	..	4	Bay	L. A. Armstrong, Rosewood
Bold Hero	..	4	Bay	G. B. Lee, Calvert
Bold Lad	..	3	Bay	W. F. Pascoe, Ceratodus
Bold Laddie ..	..	3	Bay	T. Armstrong, Rosewood
Bold Noble ..	..	3	Brown ..	V. Voigt, Glamorgan Vale
Bold Prince.. ..	..	3	Bay	F. Heise, Minden

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1934-35—*continued.*

Name.	No.	Age.	Description.	Owner.
Bounce	..	3	Bay	W. Carew, Booie road, Kingaroy
Brilliant Master	..	3	Brown	R. Stark, Wondai
Brooklyn Keynotes Dignity	..	3	Bay or brown	T. Brosnan, Killarney
Captain	..	5	Brown	C. Maas, Waterford (Provisional)
Captain	..	4	Bay	T. B. Freeman, Columboola
Captain Duke	..	4	Brown	F. Horne, Springbrook, Linville
Captain Windemere	..	3	Bay	A. Sippel, Murgon
Carlisle Clinker	..	3	Black	J. Gilmore, Goomburra
Carlyle Prairie	..	4	Bay	A. A. Treasure, Brigalow
Chrystal	..	3	Bay	N. R. Trousdell, Pinelands, Crow's Nest
Clyde Hill Intent	..	3	Bay	H. F. Steinhardt, Marburg
Clydemere	..	3	Bay	S. Hartwig, Groomsville, *via* Pechey
Craiglee Again	..	3	Brown	J. S. Pickering, Black Duck Creek
Crown Duke	..	3	Bay	R. G. Ruhle, Motley, *via* Oakey
Croy	..	4	Bay	F. G. Armstrong, Talgai
Crystal Duke	..	4	Bay	J. Kennedy, Kumbia, *via* Kingaroy
Crystal Hope	..	4	Bay	G. Telford, Nobby
Crystal Pride	..	3	Bay	A. F. Watts, Freestone
Cub	..	3	Bay	G. A. Pollock, North Kolan, *via* Avondale
Darwin	..	3	Bay	C. Cavanagh (junr.), Kybong
Dole	..	7	Bay	E. G. Lascelles, Proserpine (Provisional)
Don	..	4	Bay	J. Toft, Bundaberg
Donald Wallace	..	3	Brown	D. Birch, Conondale
Don Bradman	..	4	Bay	C. Jeynes, Glastonbury, Gympie
Don Robin	..	4	Bay	J. Campbell, Haden
Douglas Best	..	3	Bay	H. Hoffmeinster, Springsure
Duke	..	3	Chestnut	G. F. Hicks, Glenella, *via* Mackay
Duke of Invermay	..	4	Bay	W. E. Challacombe, Condamine
Earl Marshall	..	3	Bay	A. A. Stokes, Abbotsford, Melbourne
Edgecombe Prince	..	4	Bay	J. W. Ritter, Mount Tyson
Farmer	..	3	Bay	H. Hinschen, Acacia Vale, Proserpine
Farmer's Glory	..	4	Brown	F. W. Abraham, Lark Hill, Gatton (Provisional)
Fairhill Young Champion	..	Aged	Black	J. Brownlie (senr.), "Fairhill," Warwick
Foot Step	..	4	Bay	W. Schultz, Flaggy Rock
Gay Lad	..	3	Bay	G. White, Petrie
General Chief	..	4	Bay	W. F. Litzow, Tarampa
General Dale	..	3	Brown	J. V. Willis, Meringandan
Gladfield	..	4	Black	P. W. Flynn, Clifton
Glendale	..	3	Brown	J. O'Brien, Glastonbury, Gympie
Glenlad	..	3	Bay	J. Hirning, Crow's Nest
Golden Charmer	..	5	Chestnut	A. R. Hanson, Amberley (Provisional)
Grand Major	..	3	Bay	C. E. Pascoe, Ceratodus
Grand Master	..	3	Bay	H. Killer, New Moonta
Greenlea Obligata	..	3	Bay	J. M. Smith, North Otago, New Zealand
Hector	..	3	Bay	P. S. Brook, Mount Funnell, Koumala (Provisional)
Hendon Bill	..	4	Brown	G. H. Clarke, Allora
Hermitage Lad	..	3	Bay	A. A. Gillespie, Swan Hill, Warwick
Hero	..	3	Chestnut	M. J. Coonan, Lanefield
Intent's Laddie	..	3	Bay	J. V. Willis, Meringandan
John Bright	..	..	Bay	E. G. Lascelles, Proserpine (Provisional)
Johnnie's Son	..	4	Bay or brown	A. H. Jenkinson, Mundubbera
Jondaryan Carlisle	..	4	Brown	H. F. Steinhardt, Marburg
Jondaryan Janitor	..	3	Bay	C. G. Walker, Tarong road, Nanango
Jondaryan Mac	..	3	Brown	B. G. Kerle, Minden
Kingsford	..	Aged	Dark bay	J. M. C. Hyde, Tarong road, Nanango (Provisional)
Leo	..	4	Bay	Ford and Proctor, Coalstoun Lakes, Biggenden
Lion	..	4	Bay	J. J. Shine, Fernvale
Lochaber Lad	..	4	Bay	T. Laidley, Mundubbera
Lone Star	..	3	Bay	Gross Brothers, Campbell's Plains, Warwick
Lord Marmion	..	4	Bay	G. G. Wilson, Lilydale, Bell
Lord Wheeler	..	4	Brown	C.Q.M.E. Co., Ltd., Lake's Creek
Major Crystal	..	3	Bay	H. W. Genrich, Glenavon, *via* Crow's Nest
Major Dale	..	3	Bay	C. A. Kanofski, Grandchester
Major Wallace	..	4	Bay	Gross Brothers, Campbell's Plains, Warwick
Major Wallace II.	..	3	Bay	Walton Brothers, Surat
Major Wyllie	..	3	Brown	G. C. Reinke, Minden
New Hope	..	3	Bay	E. Ehrich, Greenmount
Noble	..	4	Brown	G. Tennyson, Chinchilla
Noble	..	3	Bay	T. G. O'Meara, Humphrey
Noble Lad	..	3	Roan	W. J. Ryan, Upper Freestone
Nobleman	..	3	Iron-grey	J. R. H. Frizzell, Sunnyside, Southbrook
Noble Premier	..	4	Iron-grey	J. V. B. Jamieson, Netherby
Nugget Brown	..	3	Bay	F. De Costa, Orkabie, *via* Carmila
Oakflat Chancellor	..	3	Brown	Mitchell and Muckert, Murgon
Our Hope	..	Aged	Bay	P. Booth, Yarrabine (Provisional)
Patent	..	4	Brown	J. L. Opperman, Ormeau
Pilot	..	4	Brown	T. J. Hoey, Brewer's road, Sarina
Pride of Dartmoor	..	3	Bay	F. W. Whiteway, Carpendale, *via* Helidon
Pride Shepherd	..	3	Bay	W. F. Weeke, Kleinton
Prince	..	3	Bay	P. S. Brook, Koumala (Provisional)
Prince	..	3	Chestnut	J. S. McFarlane, Eton
Prince	..	4	Bay	Schultz Bros., Neuve, Haden Line

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1934-35—*continued*.

Name.	No.	Age.	Description.	Owner.
Prince	..	3	Bay	J. W. Bickers, Kurrumbul
Prince Dale ..	..	3	Bay	A. D. Shannon, Oxford Downs, Nebo (Provisional)
Prince Meadie ..	..	4	Bay or brown	R. E. Pickels, Coolabunia
Prince Thomas ..	..	3	Bay	A. Orr, Mount Irvine, Aubigny
Punch	..	4	Brown ..	O. Reinke, Rosewood
Renown II. ..	..	3	Bay	Mrs. R. V. Breydon, Haden
Retaliator	..	4	Bay	T. J. Brosnan, Killarney
Revenue	..	3	Bay	P. Connole, Helidon
Rielly	..	3	Bay	A. Nolan, Glengallan road, Warwick
Royal Dale ..	..	3	Brown ..	C. A. Sproxton, Maleny
Royal Glencoe ..	..	3	Dark-brown	J. M. Thompson (junr.), Stanthorpe
Royal Jock II. ..	..	5	Bay	R. W. and O. Kleinschmidt, Hidden Vale (Provisional)
Royal Prince ..	..	4	Bay	W. G. Bidgood, Emu Creek, Crow's Nest
Royal Prince ..	..	3	Bay	F. J. Stone, Currajong, Gin Gin
Royal Sheppard ..	..	4	Bay	O. P. Dowling, Perth street, Toowoomba
Sandy Barton ..	..	Aged	Bay	A. D. Shannon, Oxford Downs, Nebo (Provisional)
Sandy Hurst ..	..	3	Bay	J. M. Smith, North Otago, New Zealand
Sanguine Select ..	..	3	Brown ..	J. M. Smith, North Otago, New Zealand
Shepherd Hill Prince Charlie	..	3	Bay	J. H. Kilvington, Glenore Grove
Silver Shield ..	..	3	Bay	J. D. Saul, Drillham
Sir Charles	..	3	Bay	J. Cuddihy, Helidon
Sir Donald	..	3	Black ..	J. Wilkinson, Nobby
Sir Richard ..	..	3	Bay	J. Armstrong, Wambo, Chinchilla
Snip	..	3	Bay	J. Stanbury, Proserpine
Special Mac ..	..	4	Bay	D. Gibb-McIntosh, Walhalla, Tansey
St. Helen's Brucedale	..	4	Bay	C. B. Baxley, Tipton, Dalby
Stanley Obligation..	..	3	Bay (grey hairs)	J. M. Smith, North Otago, New Zealand
Star	..	4	Blue roan ..	W. Johnston, Strathpine
Stepford Belted Knight	..	4	Bay	G. S. Miller, Freestone (Provisional)
Talamoniac ..	..	3	Bay	Evans Brothers, Oona Vale, Goondiwindi
Talgai Refiner ..	..	4	Black ..	H. C. Sprott, Ellenthorpe
Tarleton Bon Voyage	..	3	Bay.. ..	Jondaryan Estates, Jondaryan
The McIntosh ..	..	4	Bay	F. De Costa, Orkabie, *via* Carmila
Tiger	..	4	Bay	G. M. Gallaty, Gayndah
Tip	..	Aged	Bay	E. G. Lascelles, Proserpine (Provisional)
Tony	..	4	Bay or brown	P. Bryce, Wootha
Top Halls	..	3	Bay	A. Wienholt, Washpool Farm, Kalbar
Trooper Lad ..	..	4	Bay	C. L. Schilling, Club Hotel, Bowen
True Blue	..	4	Bay	M. O'Leary, Fontainebleau, Leyburn
Wallace	..	4	Bay	G. Stanfield, Proston
Wallace Monarch ..	..	3	Bay	J. Murray, Beaudesert
Windermere Cellus	..	3	Bay	L. C. Walker, Bundaberg
Woodhall Gaiety ..	..	3	Bay	R. Stokes, Collingswood, Victoria
Woorilla Regal George	..	4	Bay	Fairymead Sugar Company, Limited, Bundaberg
Worthy Carlisle ..	..	4	Bay	J. Lehmann, Coolana, *via* Rosewood
Yaccum	..	3	Bay	J. Renwick, Proserpine
Young Banker ..	..	Aged	Bay	H. Tones, Sunnyside, Homebush (Provisional)
Young Barron ..	..	5	Bay	F. Patteson, care of Walker's Bag, Nanango (Provisional)
Young Dale ..	..	4	Bay	J. B. Shannon, Tooloombah
Young Hero ..	..	3	Brown ..	S. Ryan, Pratten
Young Ivanhoe ..	..	3	Black ..	I. N. Kahler, Geham
Young Kingsford ..	..	4	Brown ..	W. A. and M. Scott, Toogoolawah
Young Scotchman	..	3	Chestnut ..	J. T. Beal, Loch Lomond, Killarney

PONY STALLIONS CERTIFICATED FOR THE YEAR 1934-35.

Aden's Chief ..	..	4	Grey dapple..	J. V. Willis, Meringandan
Bonnie Boy.. ..	..	3	Bay	C. Jose, New Moonta
Bonny Lad ..	..	3	Brown creamy	V. Perrem, Boonah
Larrikin	..	4	Dappled taffy	R. Whittington, Oakenden, *via* Homebush
Merrimint	..	4	Brown ..	E. Muggleton, Texas
Mog Wamp.. ..	..	Aged	Roan.. ..	T. E. B. Dingle, Mount Perry (Provisional)
Nifty Jim	..	4	Bay	J. Hay, Barivalve, Miriam Vale
Sir Pastel	..	4	Brown ..	D. R. Hulton, Cunningham
Spark	..	4	Black ..	H. H. Stockill, Goomeri
Spotlight	..	3	Bay	B. V. Neale, Ramsay, Cambooya
Young Guinea ..	..	4	Bay	H. H. Ehlrich, Douglas, *via* Goombungee

TROTTER STALLIONS CERTIFICATED DURING THE YEAR 1934-35.

Bricklayer	..	4	Bay	Morrell Brothers, Elphinstone
Cedarwood	..	4	Black ..	D. Perry, Millmerran
Jewel Cole	..	4	Brown ..	F. G. Armstrong, Talgai
Monto Wilkes ..	..	3	Brown ..	A. Thomasson, The Caves, North Coast Line
Sir David	..	4	Bay	H. G. Gooding, Benowa, Southport
Sparkling Ribbon ..	..	3	Bay	P. D. Flechtner, Ascot, *via* Greenmount
Vale Opera	..	4	Dark chestnut	L. T. Graham, Boonenbah, *via* Goomeri

LIST OF REJECTED STALLIONS.

List of stallions in respect of which Certificates of Registration were refused, on account of either lack of type and/or conformation, or unsoundness, during the year 1934-35. These horses are prohibited from service, either public or private:—

Blood Stallions Rejected during Year 1934-35.

Name.	No.	Age.	Description.	Owner.
Amberheart	..	5	Brown ..	C. Phillott, care of A. G. Anderson, Hendra
Blue Lad	..	5	Grey ..	P. J. Ahern, Mount Walker
Bob's March ..	..	Aged	Chestnut ..	J. W. Collins, Beaudesert
Bulayo	..	Aged	Bay	F. McNeill, Proserpine
Cylis	..	3	Brown ..	H. T. Sheppard, Greenbank
Flying Fox	..	Aged	Bay	A. O. Kunde, Hazeldean, Kilcoy
Happy Lad ..	..	6	Brown ..	H. Robson, Pomona
Hero	..	5	Chestnut ..	R. C. Welsh, Utopia, Dalveen
Highland Knight ..	..	6	Bay	J. P. Wormwell, Kupunn
King of Moya ..	..	3	Bay	J. Rayner, Harrisville
Laristo	..	Aged	Bay	E. O. Gralow, Alligator Creek, Sarina
Lucky Hit	..	3	Bay	J. Mallon, Mount Berryman
Mr. Singer	..	3	Brown ..	J. Sheppard, Greenbank
Poitrel's Will ..	..	4	Brown ..	G. H. Day, Grandchester
Polystar	..	4	Chestnut ..	C. L. O'Brien, Crossdale, Esk
Quertoi	..	Aged	Chestnut ..	D. E. Brennan, Jimboomba
Rossbrook	..	Aged	Brown ..	J. D. Hogan, Cooranga North, Bell
Seapoy	..	Aged	Brown ..	J. Williams, Harlin
Ship	..	Aged	Chestnut ..	H. F. Neale, Pittsworth
Stockade	..	3	Brown ..	A. Weinholt, Marlborough
———	..	5	Chestnut ..	J. D. Roginson, Yarraman
———	..	5	Bay	W. T. Brown, Calliope
———	..	3	Bay	J. B. Shannon, Tooloombah
———	..	4	Bay	C. M. Penrose, Beebo, Texas
Windlap	..	5	Chestnut ..	C. Hammond, Ubobo

Pony Stallion Rejected during Year 1934-35.

Guinea	..	4	Chestnut ..	R. G. Alexander, Warra

Trotter Stallions Rejected during Year 1934-35.

Abbey Boy ..	..	5	Bay or brown	H. O. Mischke, Grantham
Abbey Chimes ..	..	4	Cream ..	J. C. Schweikert, Millmerran

Draught Stallions Rejected during the Year 1934-35.

Admiral Dale ..	..	3	Bay	C. W. Stuhmcke, Mount Tarampa
Allora Intention ..	..	3	Bay	M. J. Ryan, Table Top, Allora
Bally	..	Aged	Bay	McEvoy Brothers, Netherdale
Basher	..	Aged	Bay	J. Armstrong, Killarney
Ben	..	Aged	Chestnut ..	S. Spratt, Okuloo, Finch Hatton
Billy	..	4	Bay	H. Sutherland, Beaudesert
Bold Baron ..	..	Aged	Bay	E. Hinschen, Proserpine
Braw Laddie ..	..	Aged	Bay	H. Rasmussen, Bundaberg
Bruce	..	3	Bay	G. R. Booth, Tirroan
Captain John ..	..	4	Bay or brown	T. Clark, Wietalaba
Carlisle Silver ..	..	3	Roan	A. J. Miller, Jondaryan
Charlie Boy	..	5	Bay	J. E. Watts, Rosewood
Crown Prince ..	..	Aged	Bay	D. J. McLean, Gumlu
Crystal Boy ..	..	Aged	Bay	S. McKay, Pinnacle
Crystal Lad	..	Aged	Black ..	L. G. Smart, Mulgeldie
Crystal Sign ..	..	6	Bay	W. Gilmore, Allora
David	..	Aged	Bay	W. J. Castles (junr.), Millmerran
Dawn	..	Aged	Bay	T. Trebilcock, Chinchilla
Don Pearce ..	..	4	Bay	C. Rowland, Burnett Heads, Bundaberg
Duke	..	5	Bay	A. Kahler, Geham
Duke	..	Aged	Brown ..	L. E. Taylor, Kooroongarra
Duncan	..	Aged	Bay	J. Campbell, Haden
Farmer	..	Aged	Bay	F. Wockner, Newington, *via* Jondaryan
Felton Hero ..	..	Aged	Bay	E. J. Ezzy, Kooroongarra
Fitzroy	..	5	Bay	P. Egan, "Rosewood," *via* Westwood
Glendon	..	5	Bay	Mrs. C. J. Thompson, Patrick street, Dalby
Highland Chief ..	..	5	Black ..	A. Treasure, Brigalow
Knight Abbot ..	..	5	Brown ..	F. M. Bell, Coochin Coochin
Lincoln II.	..	5	Bay or brown	T. Begley, Woodhill
Lord Marmion ..	..	4	Bay	B. T. Seymour, Kapaldo
Lord Melray ..	..	5	Brown ..	Hooper and Carrigg, Rannes
Lord Wallace ..	..	5	Bay	A. O. Harm, Byee
Major	..	4	Bay	A. W. Bubke, Dallarnil
Master Renown ..	..	3	Brown ..	J. M. Smith, North Otago, New Zealand
Newtown Baron ..	..	4	Bay	J. R. Anderson, Southbrook
Noble	..	3	Brown ..	M. W. Campbell, Moore
Perfect Dale ..	..	Aged	Bay	S. C. Luck, Freestone
Planet	..	4	Brown ..	W. Johnson, Rathdowney
Premier King ..	..	5	Bay	R. J. Cleary, Greymare

DRAUGHT STALLIONS REJECTED DURING THE YEAR 1934-35—*continued.*

Name	No.	Age.	Description.	Owner.
Prince	..	Aged	Brown ..	H. Fischer, Mountain View, Jaraga
Prince Arthur ..	..	3	Roan.. ..	W. P. Casey, Milbong, *via* Roadvale
Prince Campbell ..	..	3	Chestnut ..	A. K. Rough, Maleny
Prince of Bellevue..	..	3	Bay	A. O. Bishop, Caboolture
Punch	..	4	Bay	D. Hadlow, Kelsey Creek, Proserpine
Punch	..	Aged	Black ..	H. C. Dougall, Littlemore
Punch	..	Aged	Bay	W. O. Sing, Ubobo
Rambler	..	Aged	Bay	B. Wagner, Marylands
Raven	..	Aged	Black.. ..	Greycliffe Estate, Rannes
Revoley	..	Aged	Bay	A. G. Cross, Kingaroy
Robin	..	5	Bay	W. S. Lumley, Captain Mount, Millmerran
Royal Perfection ..	..	Aged	Bay	Messrs. Beutel and McPhee, Oakey
Royal Rolls Royce	..	Aged	Brown ..	J. Hardy, Eukey
Saltbush	..	Aged	Bay	M. R. Shannon, Olive Downs, Nebo
Sarko	..	Aged	Bay	J. Breen, Yukan, *via* Sarina
Shannon	..	Aged	Bay	E. G. Lascelles, Proserpine
Star	..	Aged	Brown ..	D. Gillespie, Emu Vale
St. Helen's Lauder Dale	..	4	Bay	C. E. Lack, Back Plains, Clifton
Thirty	..	5	Bay	F. Greenwood, Proserpine
———	..	5	Black ..	M. Ryan, Linville
———	..	6	Brown ..	E. W. Sweeney, Teviotville
———	..	Aged	Brown ..	King Brothers, Wildash, *via* Warwick
Wallace	..	6	Bay	J. Braithwaite, Chinchilla
Wallace	..	Aged	Chestnut ..	G. E. Cox, Proserpine
White Sock ..	..	4	Chestnut ..	J. Waters, Beaudesert
Willangie	..	Aged	Bay	A. Smith, Merinda
Wyllie	..	4	Bay	G. Dale, Rosewood
Young Don Robin	..	Aged	Bay	S. Pidgeon, Hivesville

QUEENSLAND SHOW DATES, 1935.

April.

Oakey, 13.
Kingaroy, 11 and 12.
Chinchilla, 16 and 17.
Nanango, 16 and 17.
Miles, 24.
Sydney, 15 to 24 April.
Dirranbandi, 24 and 25.
Rosewood Campdraft, 27.
Taroom Campdraft, 29.

May.

Wallumbilla, 1 and 2.
Taroom, 1 and 2.
Beaudesert, 1 and 2; Campdraft, 3 and 4.
Wondai, 2 and 3.
Goondiwindi, 3 and 4.
Longreach, 6 to 9.
Murgon, 9 to 11.
Blackall, 13 to 15.
Mitchell, 15 and 16.
Mundubbera, 15 and 16.
Goomeri, 15 and 16.
Barcaldine, 21 and 22.
Ipswich, 21 to 24.
Gympie, 22 and 23.
Biggenden, 23 and 24.
Toogoolawah, 24 and 25.
Kalbar, 25.
Maryborough, 28 to 30.

June.

Marburg, 1 to 3.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Boonah, 12 and 13.
Esk, 14 and 15.
Warrilview, 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Gatton, 3 and 4.
Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Cairns, 23, 24, 25.
Atherton, 30 and 31.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.

September

Imbil, 6 and 7.
Tully, 13 and 14.
Innisfail, 20 and 21.
Rocklea, 21.
Kenilworth, 28th.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 2nd April, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for April, May, and June, 1935:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 16th April, 1935—"Problems in Wheat Breeding," by R. E. Soutter, Wheat Breeder, Roma State Farm.

Thursday, 18th April, 1935—"Maintaining the Standards of Queensland Wheat," by R. E. Soutter, Wheat Breeder, Roma State Farm.

Tuesday, 23rd April, 1935—"Seed Selection," by L. G. Miles, B.Sc., Ph.D., Plant Breeder.

Thursday, 25th April, 1935—"Selecting the Breeders" (Poultry), by J. J. McLachlan, F.B.S.A., Poultry Inspector.

Tuesday, 30th April, 1935—"Soya Beans," by H. Ball, Assistant Experimentalist.

Thursday, 2nd May, 1935—"Economic Methods in the Destruction of Green Timber," by H. Ball, Assistant Experimentalist.

Tuesday, 7th May, 1935—"Agricultural Problems with Special Reference to Soil Erosion," by A. E. Gibson, Director of Agriculture.

Thursday, 9th May, 1935—"Clean Crops and Their Value to the Farmer," by A. E. Gibson, Director of Agriculture.

Tuesday, 14th May, 1935—"The Farmers' S.O.S.—'Save Our Soil,'" by J. F. F. Reid, Editor of Publications.

Thursday, 16th May, 1935—"General Problems in Plant Breeding in Queensland," by L. G. Miles, B.Sc., Ph.D., Plant Breeder.

Tuesday, 21st May, 1935—"Recording Pig Production," by L. A. Downey, H.D.A., Instructor in Pig Raising.

Thursday, 23rd May, 1935—"Housing and Management of Pigs," by L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 28th May, 1935—"The Prospects of Success with English Type Sheep in Queensland," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 30th May, 1935—"Frost Prevention by Orchard Heating," by H. Barnes, Director of Fruit Culture.

Tuesday, 4th June, 1935—"Grading Pig Products," by E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Thursday, 6th June, 1935—"Tropical Fodders—No. 1 Grasses," by C. T. White, Government Botanist.

Tuesday, 11th June, 1935—"Tropical Fodders—No. 2 Herbage," by C. T. White, Government Botanist.

Thursday, 13th June, 1935—"Shade Trees," by W. D. Francis, Assistant Botanist.

Tuesday, 18th June, 1935—"Some Native Grasses," by S. L. Everist.

Thursday, 20th June, 1935—"Artificial Incubation," by P. Rumball, Poultry Expert.

Tuesday, 25th June, 1935—"Queensland Nut Growing," by H. Barnes, Director of Fruit Culture.

Thursday, 27th June, 1935—"Citrus Culture," by H. Barnes, Director of Fruit Culture.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Feather-Top. Rhodes Grass. Stink Grass. Wild Millet.

D. (Dalby)—

1. *Chloris virgata,* Feather-top Rhodes grass. Very common in some parts of Queensland. In the Lockyer district it has invaded the lucerne paddocks and become rather a bad pest, seriously reducing the earning capacity of the fields. Though green and luscious-looking, it is generally rejected by stock, but I have heard they will eat it readily enough when made into hay.
2. *Eragrostis cilianensis,* Stink grass. A very common grass in cultivation in different parts of Queensland, especially abundant on the Darling Downs. Generally speaking, stock do not eat it, at least to any extent.
3. *Echinochloa colona,* Wild Millet. A good fodder and a close ally of such well-known cultivated species as White Panicum and Japanese Millet.

Canada Fleabane.

P.O.T. (Gooroolba)—

Your specimen represents *Erigeron canadensis,* the Canada Fleabane, also known as Horse Weed. The name Fleabane arises from the fact that this plant contains a volatile oil which is used as a deterrent for mosquitoes and other insect pests. The plant is very common in most warm temperate countries and is now very common in Queensland as a weed of cultivation lands, particularly of stubble fields and old cultivation paddocks. Some people when working among the plant find the sap very irritating to the skin.

Hop Bush. Tick Trefoil.

G.P. (Eudlo)—

The shrub is *Dodonæa triquetra,* or Hop Bush. Stock will eat this plant, and it is not known to possess any poisonous or harmful properties. It commonly comes up after a burn, although we have seen it most abundant on second-class country rather than on scrub lands. It is a shrub that lasts for several years, but we think brushing and burning would eradicate it. We have not had much experience with it as a weed, but judging by its manner of growth, we should not say it would be a pest in the same way, say, as Wild Tobacco.

The creeping legume is *Desmodium triflorum,* a species of Tick Trefoil, so called from the fact that the small pods are jointed, each joint containing a single seed. The individual joints attach themselves, by means of small hooked hairs, to clothing, feet of animals, &c., and in this way the plant is spread. It is quite a good fodder, but grows rather close to the ground to give stock, particularly cattle, anything like a decent bite.

The Quandong.

K.I.M. (Eulo)—

Three varieties of quandong are represented in Queensland:—

1. *Elæocarpus grandis,* the blue quandong. Common in the coastal scrubs of Queensland and Northern New South Wales. It has a wide distribution in this State, being found from the Tweed River to the Cairns timber district. It belongs to a totally different family of plants (Elæocaceæ) to the quandongs of the West.
2. *Fusanus acuminatus.* This, we think, is your yellow quandong.
3. *Fusanus persicarius.* This, we think, is your red quandong.

The yellow and red quandong belong to the family Santalaceæ or Sandalwood, and have the peculiar habit of being parasites, their roots lacking root hairs, and obtaining their water requirements and mineral foods in solution by means of small haustoria or suckers which attach themselves to the roots of neighbouring trees. We would be very glad to have specimens of quandongs from your district. A few branches either in flower or fruit would be gratefully received, for the material of these plants in our herbarium is very limited, particularly from Queensland.

Blood Vine.

E.S.D. (Mackay)—

It is very difficult to name specimens of plants from leaves only. That you sent, we should say, represented the Blood Vine, *Lonchocarpus Blackii,* a vine fairly common in many of the scrubs of coastal Queensland, and bearing large trusses of reddish flowers. It is highly ornamental, and is probably best propagated from seed. Some of these leguminous vines strike from cuttings, and if you care to try them you should take portions of the stem about the thickness of a pencil, or, say, a little thicker, consisting of a few joints, and place about 6 to 8 inches in fairly moist sandy soil or gravel.

Leichhardt Bean as Poultry Food.

M.F.S. (Clermont)—

We have no record of your local Leichhardt Bean or Horse Bean (*Cassia Brewsteri*) being used as food for poultry or stock. Several other members of the genus, however, are used in this way, and are said to make a good feed. We think they would be more suitable for poultry than for larger stock, and before using them on any large scale we would feel inclined to soften or boil them, and use discreetly in the first place.

Mistletoe. Red Bottle Brush. Corkwood.

P.D. (Murgon)—

1. The larger specimen, *Loranthus grandibracteus,* a species of Mistletoe, a parasite on different native trees.
2. The smaller specimen, no flowers or fruit, but I should say *Collistomen viminalis,* the Red Bottle Brush, or an allied species.

Neither of these plants is known to possess any poisonous or harmful properties.

The tree common in your district belonging to the *Solinaceæ* is *Duboisia Leichhardtii,* commonly known as Corkwood. The leaves of this are very poisonous, and, like other members of the family, contain a mixture of alkaloids.

Wild Sunflower.

S.S.B. (Roma)—

Your specimen has been determined as *Verbesina encelioides,* a native of America, now a very common naturalised weed in many parts of Queensland and New South Wales. It is most generally known as Wild Sunflower. Dr. Seddon, Director of the Veterinary Research Station, Glenfield, N.S.W., has recorded this plant as the cause of pneumonia in sheep in New South Wales. In conversation with Dr. Seddon on the matter he informed us that this particular case was one where sheep had been feeding on old cultivation paddocks where there was a predominance of this weed. So far as we know no trouble has been experienced with it in Queensland, and on the whole stock seem to leave it alone when other feed is available.

Roley-Poley. Purple Top. A Native Legume.

H.H.F. (Bowenville)—

1. *Bassia quinquecuspis,* Prickly Roley-Poley, sometimes called Bindy-eye, a name, however, applied to a large number of burr plants in Western Queensland and which, strictly speaking, we think, should be applied only to species of the genus Calotis. The genus Bassia is a large one well developed in Australia. It contains the Galvanised Burr and a number of woody plants. They are allied to the saltbushes and most of them are eaten by stock in their young stages, but soon become woody and unpalatable.
2. *Verbena bonariensis,* Purple-top. A native of South America, now a common naturalised weed over most warm temperate countries.
3. *Vigna lanceolata,* a native legume fairly common in parts of the Western Darling Downs and Maranoa districts. It is said to make quite good fodder. It often has the peculiar habit, particularly in cultivated ground, of ripening pods underground somewhat after the type of the ordinary peanut. In this case, however, ordinary pods are borne above the ground. The subterranean pods are very different to the ordinary ones, being more globose.

Poisonous Plants Harmful to Man.

H.F. (Cairns)—

The literature regarding plants poisonous or harmful to human beings is very scattered in Australia. Regarding particular kinds that grow in North Queensland, the following remarks apply:—

Legnephora Moorei, a plant of the Moon Seed family, *Menispermaceæ*, sometimes called Native Grapes, owing to the similarity of the fruits to those of a Vitis. The late Dr. T. L. Bancroft found the root bark to contain an active poisonous principle (probably an alkaloid) and this probably extends throughout the whole plant. A brief reference to children being made ill by it will be found in the "Queensland Agricultural Journal," April, 1918, p. 147.

Vitis spp.—Some of the native species of Vitis contain needles of calcium oxalate, and both fruits and the fungus themselves have caused severe irritation in the mouths of people who have accidentally eaten them.

Blepharocarya involucrigera, the North Queensland Bollygum or Rose Butternut. You will find a reference to the effects on timber workers of this wood in "Timbers and Forest Products of Queensland," by E. H. F. Swain, p. 128. A note is made to the effect that it is possible that the affection may have been provoked by vegetable spores and insect matter associated with the wood, but we do not think there is anything in this contention, as members of the family *Anacardiaceæ* are notorious for the possession of this quality. The tree has been put by some botanists in *Sapindaceæ*, and by others in *Anacardiaceæ*. The possession of a blistering sap would seem to indicate that *Anacardiaceæ* is the correct family.

Semecarpus australiensis. This is the well-knokn Tar Tree of North Queensland. It is likewise a member of the *Anacardiaceæ*, and its effects on people are probably well known to you.

Mangifera indica, the common Mango. The effects of the Mango, particularly of the fruit rind, are probably well known to you. It belongs to the same family as the last two trees.

The well-known Poison Ivy of North America, sometimes cultivated in the Southern States and in Southern Queensland as a garden creeper, belongs to the same family.

Rhodomyrtus macrocarpa. This is the well-known Finger Cherry of North Queensland. The fruit when eaten in any quantity at times causes permanent blindness in people, destroying, we understand, the optic nerve. Its effects are probably well known to you. The fruit has not been the subject of any intensive scientific investigation, although the subject warrants it. H. Tryon, late Government Vegetable Pathologist, has recorded in Government reports and in the North Queensland press that the fruit contains a saponin, and the dreaded qualities of the fruit are due to this body. The late F. M. Bailey, for many years Government Botanist, stated his impression that the fruit was only poisonous when invested by a particular fungus, *Gloeosporium periculosum*. In the former case the fruit would be most harmful when immature, the latter when overripe.

Bryonia laciniosa. A reference to children being poisoned by this vine will be found in the "Queensland Agricultural Journal" for December, 1924, pages 442 to 444.

Solanum seaforthianum, a very common climber, a native of tropical America, often grown in gardens on account of its ornamental flowers and fruit; has now run out in many areas, including the Atherton Tableland, and become more or less a pest. A reference to children being made violently ill through eating the berries will be found in the "Queensland Agricultural Journal," Volume 19, p. 238.

Datura. Several species of datura are common on cultivation and as weeds in North Queensland, including the common stramonium, and one is very abundant on the black soil plains of the Northern interior. We have not heard of any actual cases of human beings being poisoned by the plant.

Duboisia myoporoides, Corkwood. This native tree comes up very freely as a secondary growth in paddocks in parts of the Atherton Tableland and other places in North Queensland. No actual cases of poisoning of children by eating the leaves has come under our notice in Queensland, but there are several records in New South Wales.

Wikstroemia indica. A couple of years ago, fruits of this were recorded as causing the death of a child at Nambour, North Coast Line, and feeding experiments conducted at the Animal Health Station, Yeerongpilly, on guinea pigs, definitely proved them to be very poisonous. The results of this experiment have not so far been published.

Excœcaria agallocha. The late F. M. Bailey has recorded in one of his writings the fact that a child was made violently ill by chewing the sap of this tree, commonly called the Milky Mangrove, in mistake for Fig Tree sap. The blistering effect of the sap of this species and others is well known. These saps cause intense irritation and pain, and if they accidentally get into the eye cause temporary blindness.

Alocasia macrorrhiza, the common Cunjevoi, contains needles of calcium oxalate. Leaves have been accidentally chewed by children, causing intense swelling and irritation in the tender parts of the mouth. This is a feature common to practically all members of the family Araceæ-Taro, Dasheen, Elephant's Ear, &c.

Chrysopogon aciculatus, a common grass seed, or Mackie's Pest of North Queensland. The seeds are provided with an awn which produces irritating sores. Reference to it will be found in the "Queensland Agricultural Journal" for May, 1917.

The foregoing is just a brief sketch of some of the plants known to be poisonous or injurious to human beings in North Queensland. We presume you have seen the article by Dr. J. B. Cleland in the "Journal of Australia," for 10th October, 1925, in which there is a general account of plants poisonous or otherwise injurious to man in Australia, with a fairly big bibliography at the end.

Mint Weed.

S.C. (Boonah)—

Your specimen represents *Salvia reflexa,* the Mint Weed, a native of North America, which has become naturalised in several places on the Darling Downs, and one or two other localities in Queensland. It seems to have first made its appearance in the neighbourhood of Pittsworth, and for some years was confined to that area. It attracted some considerable notice a few years ago as causing deaths among travelling stock. Ordinary paddock stock, such as grazing stock, seem to be unaffected, or almost unaffected, by the plant.

Grasses and Clovers.

J.C.G. (Brisbane)—

1. The specimen of grass forwarded is not Molasses Grass but the Para Grass (*Brachiaria mutica*), better known in Queensland as *Panicum muticum,* also sometimes as Giant Couch. It is a far superior grass, we think, to Molasses grass, and is one of the best grasses for heavy stocking. It does particularly well on the North Coast Line in cultivation and in damp situations. Stock are exceedingly fond of it, but it is very frost-tender. It is, however, always worth having a small paddock of it for grazing off or cutting periodically.

2. *Poa aquatica* has not been grown in Queensland to any extent. We have heard of it doing in one or two cold localities, but on the whole it is not worth worrying about. For similar situations the Para Grass is eminently superior.

3. Regarding winter fodders, the following are a few suggestions:—

Phalaris tuberosa—one of the best.

Dactylis glomerata, Cocksfoot. We have heard of this doing exceedingly well in different parts of the North Coast Line. It is worth a trial.

Clovers.—The common White Dutch is the best to grow. This spreads into the ordinary pasture and is exceedingly common on the North Coast Line. Red clover does quite well in cultivation but, as far as Queensland is concerned, is more a clover for growing on small areas for grazing or cutting rather than sowing in the ordinary pasture.

Lotus major would probably do quite well. It has one great drawback, and that is, that it contains a prussic acid-yielding glucoside.

Strawberry Clover is worth trying, but probably would not succeed other than in wet situations.

Three Leguminous Plants. Peach-leaf Poison Bush.

C.F.F. (Calen, N.Q.).—The three specimens of leguminous plants have been determined as follows:—

1. The lucerne-like plant with the small leaf is *Indigofera trifoliata.* We have not heard a common name applied to this, but it is fairly common in North Queensland and is looked on as a valuable fodder. It is also common in India and in that country, likewise has quite a reputation as a fodder for stock.
2. The plant with a medium-sized leaf is *Pycnospora hedysaroides,* a very common plant in much of the native pasture of North Queensland. We have not many records of it as a fodder, but it is probably quite a useful plant in the mixed pasture.
3. The plant with a large leaf is *Uraria lagopodioides.* The same remarks apply as to No. 2.

All three plants are legumes, should be quite nutritious, and we do not think any of them would bloat stock.

Regarding the Peach-leaf Poison-bush, the bright-leaved one is *Trema aspera* var. *viridis,* and the soft-leaved one is *Trema orientalis.* Both are slightly different to the common Poison-bush of Northern New South Wales and Southern Queensland. The properties are probably much the same, although the one with the green leaf is generally looked on in North Queensland as the more virulent of the two. In spite of the fact that these plants have a very bad reputation as poisonous plants, stock frequently browse on them with impunity.

Mr. K. S. McIntosh, Veterinary Officer, Animal Health Station, Yeerongpilly, recommends the following treatment of affected animals:—

Treatment.—If peach poisoning is common on the property it would be economical to keep a few bottles of the following antidote on hand and administer *as soon as the symptoms are noticed.*

Bottle No. 1.

Perchloride of iron	3 ounces
Water	8 ounces

Bottle No. 2.

Calcined magnesia	1½ ounces
Water	8 ounces

Add No. 1 to a pint of water, add contents of No. 2 and stir. Administer the whole quantity.

Also inject ½ to 1½ oz. of sulphuric æther under the skin with a hypodermic syringe.

The animals should immediately be removed from access to the plant. If practicable, eradication of the plant is the best method of preventing the trouble.

Mat Grass.

J.R.W. (Millaa Millaa)—

The specimen represents *Axonopus compressus,* the narrow-leaved carpet grass or mat grass. This grass was boomed as a fodder some years ago, and has some very definite value for second-class country. The only trouble found with it in parts of Queensland is that it invades the paspalum pasture; and if it gets a good hold may ruin the pasture in much the same way as sour grass or yellow grass, which is common in some of the wetter parts of the Atherton Tableland.

Boonaree.

W.Q. (Baking Board)—

Your specimen represents *Heterodendron oleæfolium,* commonly known in parts of Western Queensland as boonaree. Western rosewood is another name often applied to it. It is a shapely tree eaten readily by stock. The leaves, however, contain a prussic acid yielding glucoside, and if hungry stock are allowed to gorge themselves on it trouble may ensue. It is very rarely that any losses are experienced with thet plant in Queensland, but a year or two ago there was a rather serious one in the Roma district, when hungry sheep had been allowed to gorge themselves on the leaves of this tree freshly felled and then went straight away and had a drink of water.

Grasses and Plants Identified.

A.H.H. (Chinchilla)—

1. *Panicum uncinulatum.* A very wiry Panic grass generally found growing on the edge of scrubs. It is very common in some brigalow areas, and, in spite of its wiry nature, seems to be very freely eaten by stock, and on the Western Downs and Maranoa has rather a high reputation as a fodder.
2. *Panicum buncei,* a native Panic grass. Most of the native Panic grasses are generally regarded as quite good fodder.
3. *Sporobolus pallidus,* Fairy grass.
4. *Panicum subxerophilum.* A very common grass in parts of the Western Darling Downs and Maranoa districts. It is often seen growing in billabongs. In spite of its wiry nature stock seem to eat it readily enough, particularly towards the end of the season.
5. *Leptochloa decipiens* var.
6. *Eragrostis cilianensis,* Stink grass. An imported grass usually only seen as a weed of cultivation. Generally speaking, stock do not take to it and it has little value as a fodder.
7. *Diplachne Muelleri.*
8. *Eriochloa* sp., Early Spring grass. All the *Eriochloa* grasses have good reputations as fodders.
9. *Bothriochloa decipiens,* Bitter Blue grass, Red Leg, or Pitted Blue grass. Not regarded as of much fodder value.
10. *Echinochloa colona,* Barnyard Millet. A useful fodder grass closely related to such well-known cultivated fodders as Japanese Millet and White Panicum.
11. *Cassia Sophera* var. *schinifolia.* A very common bush in parts of Western Queensland. It has been reported poisonous to stock, but feeding experiments with allied species of *Cassia* in Queensland have shown them to have purgative properties but not to be otherwise harmful. It belongs to the same family as the senna of commerce.
12. *Commelina cyanea.* Sometimes called Scurvy grass.
13. *Boerhaavia diffusa,* Tar Vine. Generally regarded as a useful fodder plant.

Milky Cotton Bush.

J. McD. (Cawarral)—

Your specimen represents the Milky Cotton Bush (*Asclepias curassavica*), a plant belonging to a dangerous family, the *Asclepiadiaceæ.* In conversation with Dr. Seddon, of the Glenfield Research Station, he informed us that feeding tests carried out in New South Wales with this plant have definitely proved it to be poisonous. We have not yet had many cases of poisoning by it in Queensland, and the only ones that have come under our notice have been where calves have eaten the plant in some little quantity. Generally speaking, ordinary stock seem to avoid the plant, or at least not eat it in sufficient quantity to cause trouble.

White Crepe Myrtle. Chalta Tree.

T.L.B. (Caboolture)—

The specimen represents *Lagerstroemia indica* var. *alba,* the White Crepe Myrtle.

The leaf from the tree at Dunwich represents *Dillenia indica,* the Chalta Tree, a native of India. The fruit is there said to be used in curries, also in the making of jellies. Although we have seen several trees in different parts of Queensland we have not known anybody here use the fruit in any way. It is quite a handsome tree and well worth growing for its ornamental foliage and large white flowers.

Water Hyacinth.

W.R.B. (Toogoolawah)—

Water hyacinth is a pest if it gets into running creeks. In dams and tanks, particularly away from streams, it can generally be kept in check. Probably the seeds were carried into your dam on the feet of water fowl. Stock eat the plant quite readily. It does not injure the water in any way. We would recommend that you get rid of it on account of the danger of its spreading into nearby creeks and rivers.

General Notes.

Staff Changes and Appointments.

Mr. J. Northcott, Caretaker of the Stuart River Dip, via Tingoora, has been appointed an Honorary Inspector of Stock.

Mr. S. C. O. Jessop, Inspector of Stock, Toowoomba, has been appointed also an Inspector under the Brands Acts.

Mr. G. F. Young, Inspector of Stock at Crow's Nest, has been appointed also an Inspector under the Brands Acts.

The following transfers of officers in the Department of Agriculture and Stock have been approved:—

Mr. C. Schindler, Inspector under the Diseases in Plants Acts, from Stanthorpe to Tallebudgera;

Mr. G. W. J. Agnew, Banana Agent, from Tallebudgera to Nambour; and

Mr. R. L. Prest, Instructor in Fruit Culture, from Nambour to Brisbane.

Messrs. J. R. D. Munro, F. C. Coleman, J. Davies, J. Cattanach, and P. A. Kelly, Inspectors of Dairies at Clifton, Pittsworth, Chinchilla, Esk, and Oakey, respectively, have been appointed also Inspectors under the Slaughtering Act; Mr. C. P. Joyner, Inspector of Stock at Cooyar, has been appointed also an Inspector under the Slaughtering and Dairy Produce Acts; and Messrs. J. W. Mackay and S. E. Fogg, Dairy Inspectors at Wowan and Malanda, respectively, have been appointed also Inspectors under the Slaughtering and Diseases in Stock Acts.

Mr. H. G. Noble, Gradule, has been appointed an Honorary Inspector of Stock.

Mr. R. Moore, of Bardon Estate, Bardon, who acts as Ranger for the Brisbane City Council, has been appointed also an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. S. Edwards, Lake Pleasant, Goovigen, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. T. K. Kelly, Field Assistant at the State Farm, Roma, has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts.

Acting Sergeant F. H. Bate, Nebo, has been appointed also an Inspector under the Brands Acts.

Citrus Levy.

A regulation has been approved, under the Fruit Marketing Organisation Acts, extending for a further twelve months from 1st March, 1935, the Citrus Levy which was approved in March, 1934. A slight alteration is made this year, it being provided that no levy shall be imposed on single case consignments which form part of a consignment with other fruits. It is maintained that single cases by rail are mostly growers' direct country order trade which should be encouraged.

Butter and Cheese Boards.

Notice of intention to extend the operations of the Butter and Cheese Board for the period from the 8th February, 1935, to the 30th June, 1935, was published in the "Government Gazette" on the 19th January last, and petitions on the question of the continuance or otherwise of these boards, to be lodged by the 18th February, were invited from growers. No petitions were received, and Executive approval has accordingly been given to-day to the issue of Orders in Council extending the term of both boards until 30th June next, and providing that the present members of each board shall continue to hold office until such date.

The present members of the Butter Board are—Messrs. J. Purcell (Toowoomba) (Chairman), W. J. Sloan (Malanda), R. H. Hill (Bororen), J. McRobert (Maryborough), T. F. Plunkett (Beaudesert), A. G. Muller (Fassifern Valley, Kalbar), and E. Graham, Director of Marketing).

Members of the Cheese Board comprise—Messrs. H. T. Anderson (Biddeston) (Chairman), T. Dare (Narko), A. J. Harvey (Pittsworth), D. G. O'Shea (Southbrook), A. Pearce (Coulstoun Lakes), and E. Graham, Director of Marketing).

Isis District Cane Growers' Executive.

An Order in Council has been issued amending the Primary Producers' Organisation and Marketing Acts by inserting a provision creating the Isis District Cane Growers' Executive. Representations have been made by the Isis Mill Suppliers' Committee and others for the creation of a separate Executive for the Isis canegrowers, and action has now been taken to provide that the Isis Mill Suppliers' Committee shall constitute the Isis District Cane Growers' Executive.

A Goondiwindi Sanctuary.

"Kildonan," the property of Mr. Walter Gunn, at Goondiwindi, has been declared a sanctuary for the protection of animals and birds, and Mr. Gunn has been appointed an Honorary Ranger under the Animals and Birds Acts in respect of the sanctuary.

Tubercle-free Herds.

The following herds have been declared free from tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle free:—

Owner and Address.	Number tested.
D. R. Hutton, Cunningham	42
Paterson and Paterson, Croxley, Oakey	95
R. A. Slaughter, Clifton	16
Grimmett and Sons, Sherwood	61
F. P. Allan, Stoneleigh Dairy, Oxley	63
H. H. Dight, Warwick	37
E. H. Heale, Riverdale, Kureen	34
Clayton Brothers, Tinana	95

Abortion-free Herds.

The following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free:—

Owner and Address.	Number in herd.
Clayton Brothers, Tinana	95
Grimmett and Sons, Sherwood	61
F. P. Allan, Stoneleigh Dairy, Oxley	63
H. H. Dight, Warwick	37

Newspapers—Insufficient Postage.

Considerable trouble is experienced by the Postmaster-General's Department in connection with newspapers posted by the public bearing insufficient postage, and records show that in Brisbane alone 661 newspapers with insufficient postage were posted during a period of two weeks. On these figures it can well be imagined the large number of such articles which must be posted throughout the Commonwealth during each year.

Insufficiently prepaid newspapers to addressees in Australia are taxed double the deficient postage and sent on, whilst those for persons beyond the Commonwealth are forwarded to the Dead Letter Office. Obviously much disappointment would be felt by overseas addressees in not receiving papers posted to them, whilst those people from whom taxes were demanded before delivery of their papers would also feel aggrieved.

In the circumstances it would be advantageous, both in your own and your patrons' interests, if you were to print on the front page of your publication (especially issues of more than normal weight), the postage charges applicable to copies posted for delivery in Australia and in the principal countries of the world where purchasers are likely to send copies to their friends.

The following are the rates of postage on newspapers posted to:—

Addresses within the Commonwealth, New Zealand, and the islands annexed thereto, also Fiji	1d. per 6 oz.
United Kingdom and Irish Free State, via France or America	1d. per 4 oz.
Via All Sea route	1d. per 6 oz.
Other places in the British Empire	1d. per 4 oz.
Foreign places	1d. per 2 oz.

Plywood and Veneer Board Levy.

Regulations empowering the Plywood and Veneer Board to make a levy of 3d. per 100 feet face measurement on deliveries of pine plywood were issued on 5th January last. The proceeds from the levy were to be used to establish a fund for the purpose of subsidising growers for plywood despatched outside the Commonwealth. Approval has now been given to an amendment of the abovementioned regulations to provide that all deliveries under the base price of 14s. per 100 feet for three-sixteenths inch sanded one side, first-class pine plywood shall be exempt from the levy.

Sugar Experiment Stations Advisory Board.

Executive approval has been given, in pursuance of the provisions of "*The Sugar Experiment Stations Acts Amendment Act of* 1934," to the appointment of the following as members of the Sugar Experiment Stations Advisory Board:—

Hon. F. W. Bulcock (Chairman),

Dr. H. W. Kerr (Director of Sugar Experiment Stations),

Messrs. W. D. Davies and B. Courtice, of Innisfail and Bundaberg, respectively, representing the sugar-cane growers; and

Messrs. John Smith (General Manager of Farleigh Co-operative Sugar Milling Association, Limited) and W. F. Seymour-Howe (General Manager of the Mulgrave Central Sugar Mill), representing the manufacturers of cane sugar.

Arsenic in Wool Inquiry.

Executive approval has been given, in pursuance of the provisions of "*The Official Inquiries Evidence Acts*, 1910 *to* 1929," to the appointment of a committee consisting of Dr. J. Grahame Drew, of the Department of Public Health; Mr. J. Carew, Senior Instructor in Sheep and Wool, Department of Agriculture and Stock; and Mr. O. J. Kelly (representing the A.W.U.), to investigate the effects of arsenic on persons engaged in the pastoral industry as a result of the use of arsenical preparations for the jetting or dipping of sheep for blowfly. Mr. A. C. Boyle, of the Department of Agriculture and Stock, has been appointed Secretary to the Committee.

Mysterious Poultry Disease.

Mr. G. C. McLennan, Veterinary Pathologist of South Australia, in a paper presented to the meeting of the Australian Veterinary Association, and considered at the Science Congress in Melbourne, dealt with a comparatively new disease in poultry as far as Australia is concerned. Fowl paralysis (*Neurolymphomatosis gallinarum*) was first described by Marek from Austria in 1907. From then until 1921, when the condition was reported by Kaupp in the United States of America, apparently nothing concerning the disease appeared in the literature. Up to the present, and particularly since 1926, much research work had been carried out. The disease has been reported as occurring in England, America, Germany, Austria, Holland, Japan, and Australia. The usual age at which birds begin to show symptoms in South Australia was about three months, but cases had been observed at eight weeks, and five to six months. Both sexes, and apparently any breed, were susceptible. A feature of the first occurrence in South Australia was the explosive nature of the outbreak. It appeared quite suddenly, and affected approximately 10 per cent. of the flock, and as far as could be ascertained had not reappeared in three years. The incidence in Australia did not appear to be high. The symptoms appeared quite suddenly, and were characterised by a paralysis of the legs, which varied in degree. Gasping was common, and in active cases the appetite was affected. Neither wing paralysis nor iritis had been observed. Rufiling of the feathers of the head was common. The duration varied—some cases went on to death in ten days; others survived for three months, eventually dying from emaciation and exhaustion. The pathological findings by the writer of the paper differed somewhat from those recorded by other observers. Many theories had been advanced to explain the ætiology of fowl paralysis, but most workers were of opinion that the condition was of the nature of an infection, although there were some who considered that the cause lay in some nutritional factor. No micro-organism had been seen or cultured, and the experimental proof that the ætiological agent was a virus was not convincing. His (Mr. McLennan's) experiments designed to test the virus theory were, with the exception of one, entirely negative. The result of the one experiment in which positive results were obtained could be explained by the interference with the egg necessitated by the technique.

Rural Topics.

Poisoning Green Timber.

"Frilling" and poisoning with an arsenic solution has been found an effective way of rapidly killing green timber, though the usual drying out must, of course, take place before the dead tree can be burnt. If the operation is carried out when the sap is just completing its downward course, states a departmental leaflet, suckering is largely prevented.

A useful formula for quick and effective work in all kinds of timber is arsenic 1 lb., washing soda 1 lb., or caustic soda ½ lb., water 3 gallons. Arsenic—the ordinary white arsenious oxide of commerce—is not soluble in water to any great extent, so that soda, either the ordinary washing soda or caustic soda, has to be used to dissolve it. When large amounts of the solution are required, washing soda will be the cheaper, but for small quantities of solution caustic soda will possibly be found the handiest.

When preparing the solution, whether caustic soda or washing soda is used, first dissolve the soda in a convenient amount of water, using heat, if desirable, to hasten the process; then slowly add the arsenic, which has been previously made into a thin paste, stirring all the time; place on a strong fire, and after it has come to the boil, allow it to remain boiling for at least half an hour; stir from time to time, and be careful to stand on the side away from the fumes, as they are poisonous and are apt to cause sickness. When the arsenic is thoroughly dissolved, the solution may be made up to the required bulk by adding the remainder of the water, either hot or cold.

Frilling the tree consists of a succession of downward axe cuts completely round the trunk, each cut well overlapping the adjoining ones, so as to leave no unsevered section of bark up which the sap can flow. The cuts must be through the bark and well into the wood proper, and as close down to the ground-level as it is convenient to cut them consistent with the shape of the trees, say, from 6 to 10 inches up. For trees of 4 feet in diameter pour about a quart of solution into this frilling right round the tree, using an old teapot or kettle, as the spout makes pouring easy, and less is wasted in spilling. Smaller trees naturally need less solution. Saplings may be cut off low down and the solution dabbed on with a swab-stick to kill and prevent suckering.

It is very important that the frilling and the application of the poison be consistently and thoroughly carried out and not in any way scamped or slummed if good results are to be looked for.

There need be no fear of stock being poisoned by eating the fallen or dead leaves from poisoned trees, for with the comparatively small quantity of solution used the likelihood of leaves absorbing any free arsenic is very remote, but there is some danger to stock grazing on areas frilled and poisoned, and it is desirable to keep all stock off for three or four weeks, when all possible chance of danger will have disappeared.

Arsenic pentoxide, as used by the Prickly-pear Board, may be substituted for the arsenic and soda. It is soluble in water, but as it has a corrosive action wooden or earthenware containers will be required.

Cleaner Milk—Points in Dairy Practice.

The party of New South Wales farmers who toured New Zealand last year observed many useful points in practice on Dominion dairy farms. In the South Island, particularly, the water supply is nothing like the problem it is in parts of Australia, and on those dairy farms where a reticulated water system is possible the following point will have a definite interest:—Where practicable, it is usual to have a car sponge attached to a hose and water supply for washing the cows' udders. This idea enables the udders to be cleansed with running water, thus replacing the usual teat rags, so often a fertile source of harmful bacteria. The use of these teat-washing sponges is claimed to have appreciably lowered the bacterial count of the milk.

Another idea adopted in some dairies in New Zealand is the use of chains in the place of the usual leg ropes. These are considered much more hygienic than the much-stained ropes that are a feature of almost every dairy in the Dominion.

Whitewash.

The method for making what in the United States is commonly known as "Government" Whitewash for both indoor and outdoor work is as follows:—Take 35 lb. to 40 lb. of high quality quicklime, slake with warm water, covering it during the process to retain the steam; strain the liquid through a fine sieve or strainer; add a peck (14 lb.) of salt, previously well dissolved in warm water, 3 lb. of ground rice boiled to a thin paste and stirred in boiling hot, ½ lb. of powdered Spanish whiting, and 1 lb. of glue which has been previously dissolved over a slow fire. Add 5 gallons of hot water to the mixture, stir well and let it stand for a few days protected from dirt. It should be put on hot. One pint of the mixture, properly applied, will cover 1 square yard. Small brushes are the best. There is nothing to compare with it for outside or inside work, and it retains its brilliancy for many years.

Improved Pastures Demand Improved Management.

In the August number of the Journal of the Council for Scientific and Industrial Research, I. Clunies Ross, D.V.Sc., gives a review of the evidence collected in connection with the various pasture factors which influence the degree of parasitism in sheep. In recent years it has been recognised that the extent of parasitic infestation of stomach and intestinal worms in sheep can, in some measure, be controlled by the system and type of feeding practised. Investigations have been made in Australia to determine the effects of improved pastures in (*a*) increasing the degree of parasitism owing to the heavier stocking, or (*b*) so improving the nutritional state of the sheep that they were able to resist infestation, or at least the effects of infestation. It was found on improved pastures carrying three sheep per acre when rotation was practised, and two and a-half sheep without rotation, that there was a greatly increased wool production per sheep when compared with similar animals grazed at the rate of one sheep per acre on natural pasture. In addition, it was assumed that, under the conditions existing in the experiments, the improved nutrition of the sheep more than compensated for any increased risk of parasitism which might have eventuated as a result of the heavier stocking.

However, it must not be assumed from these conclusions that the establishment of improved pastures and the resulting heavier stocking will eliminate internal parasites as a serious stock complaint. The importance of internal parasites on such pastures is dependent on several factors, of which the chief are: the composition of the pasture, the quantity of feed available for the sheep, the duration and heaviness of stocking, and the soil and seasonal conditions in so far as they may increase or decrease the chances of infection.

Influence of Overstocking.—Overstocking is likely to occur on improved as well as on natural pastures. In both cases it will result in lowering the nutritional plane of the sheep, so reducing their resistance to worm infestation. In addition, it would be favourable to the development of the vast numbers of worm eggs and larva voided by the large number of stock. With many stock on a small area the risk of severe infestation consequently becomes very high.

Cases have been reported where graziers have crowded sheep badly infested with small intestinal worms on small areas of good feed for a few days in the hope that the better feed will help the stock over the trouble. Should the weather at the time be favourable to the development of the vast numbers of worm eggs expelled by the stock, there is a big risk of a very much heavier infestation of the sheep taking place. The risk is much greater when the days are showery and mild than when the weather is dry or temperatures are low, for under these latter conditions the eggs are much longer reaching a stage in which they can infect the stock.

Composition of Pasture.—Pastures vary greatly in their composition, and some are particularly poorly balanced in regard to the proportion of clovers and grasses they contain. On such pastures the losing of condition by stock may occasionally occur, and the farmer is sometimes prone to blame worms when he should really attribute the loss in condition to the failure of the pasture to provide the balanced diet required.

In concluding, Dr. Ross states: "Notwithstanding the foregoing discussion of some of the factors which tend to offset the benefit of improved pastures, there is no doubt that the overwhelming body of evidence available indicates that the artificial improvement of pastures by topdressing and the introduction of clovers and improved grasses constitutes a very vital factor in controlling the effects of parasitism and in increasing production." But pastoralists must realise that with such pastures much more attention must be paid to every aspect of pasture and stock management. The methods employed on natural pasture are not suited to improved pastures, and if they are used on these latter considerable loss may be expected both in the health of the stock and in the production of the land. Improved pastures demand improved management.

For Improvement of Orchard Soil.

Every opportunity should be taken of applying to orchard soils bulky organic matter such as bush rakings and the first cuts from lucerne which will rot down and add to the amount of humus. It should be remembered that the nitrifying bacteria which are necessary to convert such vegetable matter into humus require nitrogen and thus use and temporarily lock up the available nitrogen in the soil. Hence it is preferable to apply bulky organic matter during the winter, when this locking up of available nitrogen will prevent its loss by seepage; moreover, it will give time for the process to complete and the nitrogen to be available again to the trees when they awake into activity in the spring.

Where bulky organic matter such as bush rakings, which contains only comparatively little nitrogen, is applied it is an advantage to give a dressing of sulphate of ammonia and carbonate of lime, allowing about ½ cwt. of the former and ¾ cwt. of the latter per ton of rakings. When estimating the weight of bush rakings the weight of the leaf only should be calculated, not of any soil or stones that have been collected with the rakings.—A. and P. Notes, N.S.W. Dept. Agric.

Stands for Cream Cans.

Cream-grading at factories by dairy officers has shown that in far too many cases cream which would otherwise have been graded choicest has had to be placed in an inferior grade through being exposed to the rays of the sun whilst waiting to be picked up by the factory lorry, and has indicated the necessity of cream stands being erected by all suppliers who leave their cream at the roadside to be picked up by the carter.

Dairymen should be sufficiently alive to their own interests to erect some protection for their cream from the direct rays of the sun whilst it is awaiting transport, particularly at times such as these when prices for butterfat are at such a low level. This does not appear to be the case, for a journey along many country roads will show that in many instances cream cans are stood at the roadside quite unprotected. During period of high prices, a half-penny or even a penny per lb. from their cream cheque may not have appeared serious to many dairy farmers, but with the values ruling at present no farmer can afford to run any risk of deterioration of his product which will entail his receiving less than the highest possible price, particularly when the trouble may be obviated practically without cost.

Any deterioration in quality of cream is primarily a loss to the individual supplier, but it also reflects on the prosperity of other suppliers and on the State as a whole. There can be no doubt but that the large percentage of inferior butter contained in our export pack has a very definite bearing on the price which we receive for our choicest butter, and any factor which may influence ruling market rates for our butter is definitely the concern of the State.

A cream stand is not an expensive item and can usually be constructed from material available on the farm, and the only expense will be the small amount of labour involved. No definite type or size of stand is prescribed, and it is left solely to the supplier himself to determine how simple or how elaborate a stand he constructs. The stand should be sufficiently high to raise the cream can two feet or more above ground level, and it should be so constructed that the sun cannot shine directly on to the cream can. The type of stand recommended is one which has a floor at least two feet about ground level, the floor being constructed of narrow slats with a gap between each slat. The back and sides should be louvred to permit free circulation of air, which will tend to keep the cream cool. The top should be watertight and should have a sufficient slope to turn off all rain.—"Tasmanian Journal of Agriculture."

A Remarkable Litter.

A litter of Large White pigs owned by Messrs. Hibberd Bros., Grenier Park Stud, Gold Creek, Indooroopilly, was officially weighed on the 16th March, when they were eight weeks old. The litter consisted of eight pigs, the individual weights of which when fifty-six days old were:—

Sex:	Boar	Boar	Boar	Sow	Sow	Sow	Sow	Sow
lb.:	55	43	43	48	46	48	46	55

Average weight, 48 lb.

While these results are not claimed as a new record they are considered to be well above the average. The dam of the litter is "Highfields Pearl 11th," and the sire "Norfolk Baron 2nd."

Handle Poisons Carefully.

The casual handling of poisons is again illustrated by the District Veterinary Officer (North) in his monthly report, observes the Chief Veterinary Surgeon of the New South Wales Department of Agriculture. The report points out that three calves died in a northern district from eating rabbit poison. In the calf paddock was found an old kerosene tin containing eight leaking tins of this poison, and it was evident that the calves had partaken of it. In a coastal district a stockowner carelessly used an arsenical preparation on his banana plantations, to which he allowed cattle to have access, and as a result two cows died. It is astonishing that there is not more human mortality as a result of the way in which such preparations are treated.

Feed for Fat Lambs.

If the producer is to be able to supply the type of lamb demanded by the export market there must be no shortage of good feed throughout the animal's growth. This involves supplementing the pasture with such crops (according to the district) as oats, skinless barley, rape, turnips, and lucerne. In every case autumn is the time for sowing, and it is in autumn, too, that sowings of grasses and clovers for pasture improvement should be made.

Trusting to natural pastures is extremely risky—very rarely will prime lambs be produced off such feed—but by means of top-dressing and the sowing of better grasses and clovers a large proportion of our pastures are capable of being enormously improved. Pasture so improved, in combination where necessary with lucerne and other fodders, will enable that standard of feeding necessary for the production of high quality carcases.

The importance of consistently good feeding during the growth of the lamb cannot be too strongly stressed. An uneven system of feeding and forcing lambs will result in lumpiness through excessive fat in certain parts. The perfect export lamb is not grossly fat, but has a maximum of meat properly spread with a reasonable covering of fat, and this can only be produced by regular and high quality feeding of both the ewe and lamb.

The Horse and His Food.

For perfect mastication the teeth of the horse must be in good order. Frequently in young animals mastication is imperfectly performed, due to faulty shedding of the first teeth; while in older animals, the edges of the teeth became so long and sharp that mastication becomes almost impossible. Horses so affected will bolt their food without proper crushing, and this, of itself, frequently causes colic through fermentation in the stomach. Teeth should be examined occasionally, and treated if necessary, as, apart from colic, faulty teeth are responsible for a great loss of condition.

If small balls of partly-chewed food are found in the manger, watch the horse eating, when it will probably be found that he gives two or three rapid movements of the jows, and drops the food from the mouth. This process is known as "quidding," and indicates that the teeth are badly in need of attention. Even horses whose teeth are in good order frequently bolt their food from habit. This should be prevented by mixing chaff or dry bran with the grain, and by placing several large stones in the manger to prevent bolters from securing too big mouthfuls at a time.

Another cause of bolting is the practice of giving boiled food. This is not only unnecessary, but often distinctly harmful. Boiling does not increase the digestibility of food, but permits of bolting without mastication, and sudden overloading of the stomach. Further, boiled food, if not given directly it has been prepared, is apt to undergo fermentation. Linseed is the only food that requires boiling before use.

Should a horse's stomach become overloaded he cannot relieve it by vomiting, as, owing to the anatomical arrangement, vomiting is impossible. To this danger must be added the further one that the pressure of food in an overloaded stomach may cause the opening into the small bowel to become closed also. When this takes place, food is imprisoned in the stomach, and after a short time ferments, and ultimately, owing to the stretching of its walls, the stomach becomes paralysed. Cases of this sort frequently occur, and rupture of the stomach is not an uncommon sequel.

Measuring the Weight of a Pig.

The smaller the animal the greater the risk of error in calculating the dead-weight from measurements and calculation. However, a rough guide may be obtained by measuring the length and girth, taking the girth of the animal in inches, just behind the shoulders (A B) right round the body, and measuring the length in inches from a point midway between the ears, along the curve of the back (C D), to the tail-head. Then to get the approximate dead-weight of the animal in pounds use the following formula:—

$$\frac{\text{Girth}^2 \times \text{length}}{524} = \text{Dead-weight in lb.}$$

Thus, if the length measured as shown were 46 in. and the girth 40 in., then by squaring the girth (i.e., multiplying it by itself) the result is 1,600, which multiplied by the length gives a product of 73,600. This figure, divided by 524, gives approximately 140 lb., which would be the dead-weight required.

There can be no doubt that the system of actually weighing the pigs alive is better, and this may be done conveniently by means of platform scales, or by means of a crate suspended from a large spring balance. If the live-weight is actually

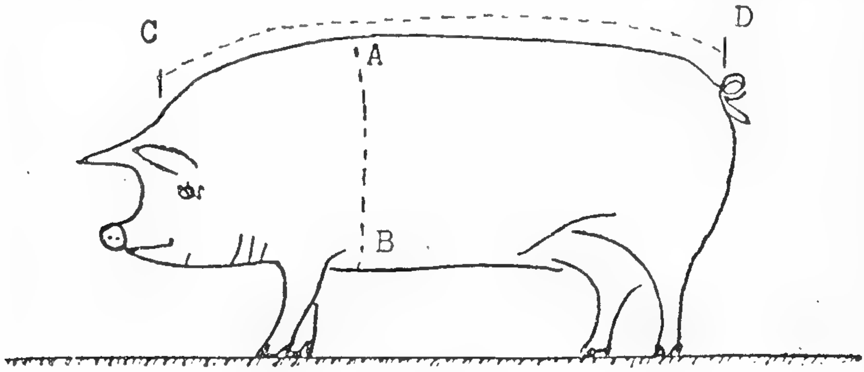


Plate 163.

taken by weighing in this way, then it is necessary to calculate the dead-weight from it by estimating that the figure required will be from 70 to 80 per cent. of the live-weight, according to skill in judgment and the degree of fatness attained by the animal.

Kikuyu Grass.

An object lesson that is mostly wasted on city folk is provided at present by the very profuse and luscious growth of Kikuyu grass on the eastern side of Sydney Domain, observes the "Agricultural Gazette." This grass was planted some eight years ago at the suggestion of the Department's Agrostologist, the idea being to keep down weed growth on a section of the park that was rough and otherwise difficult to keep free of weeds.

Not only does this area of Kikuyu demonstrate very forcibly the vigorous growth that this introduced grass is capable of making under suitable Australian conditions, but there is also provided an interesting comparison between paspalum (another introduction) and Kikuyu. Patches of both grasses are growing side by side and while both have been allowed to run wild, more or less, in appearance the Kikuyu grass has everything to recommend it while the paspalum is dry and matted, and would certainly prove most uninviting to cattle.

This is in accord with the general experience for some years past in coastal districts that Kikuyu grass will smother paspalum. In addition, Kikuyu grass has proved particularly suitable for planting in areas infested with bracken fern, ink weed (dye-berry), stinking roger, and weeds of similar type which frequently make headway at the expense of succulent pasture plants. It is thus an economic means of controlling these useless plants and of converting such areas into useful grazing land.

The Increasing Danger of Hydatids.

The article that appeared in our last issue ("Pastoral Review" for February, 1935) on the menace of hydatids, by a leading veterinarian, will, we hope, lead to greater care in the handling and control of station dogs. Hydatid disease is a most unpleasant complaint, and the steady increase in its incidence throughout our rural communities is a very serious matter. It is caused by a certain minute tapeworm of the dog, and Clunies Ross has found up to 40 per cent. of station dogs to be infected in New South Wales. In view of that fact it is not difficult to visualise the risk a human being runs every time he or she handles a station dog, for excreted eggs may well be on the latter's coat, and it is the simplest thing in the world for them to be transferred to the human mouth per medium of a cigarette or handkerchief or some other means. Again, the way young children are allowed to fondle dogs or to play about their kennels can only be appalling to those who know the extent and simplicity of infection. The reason why station dogs and country slaughterhouse dogs are far more often infected with the hydatid tape worm than city dogs is, as the article last month pointed out, because station dogs are fed on raw viscera of ration stock that are frequently infected, while country slaughterhouse dogs have access to diseased offal wherever there is lack of efficient supervision. City dogs are seldom found infected, because city meat supply is adequately inspected and all diseased offal is condemned before it can get into circulation. Insurance against contraction of the disease lies largely in country people's own hands. They must first prevent infection of their dogs by never feeding raw offal to them—boil it for ten minutes—and they must make it impossible for the dogs to get to the killing pen or any area where killing is done. Secondly, they must obviate any risk of infection from an already infected dog by exercising care in handling, by washing when possible after such, by regularly burning all droppings from around dog yards and kennels rather than allowing them to disintegrate and spread the hydatid eggs, and by treating dogs regularly with a reliable medicine to remove the hydatid tapeworm. Finally, in any country town of importance there should be centralised slaughtering and efficient veterinary supervision of the meat supply.—"The Pastoral Review."

Judging a Southdown Sheep.

Mr. A. L. Wheeler, a recognised authority on Southdown sheep, has set forth in the "New Zealand Farmer" the following points to be observed in judging sheep of this breed:—

The essential object in raising Southdowns, said Mr. Wheeler, was to meet the requirements of the fat lamb trade. In body it should be built more or less on the lines of a benzine box, but proportionately rather wider. The "box" should be set on legs absolutely at each corner. The feet of the Southdown were not quite as large as those of the Romney, but should be reasonably large. A narrow, pointed foot was undesirable. The pastern should be strong, and set so that the sheep could move. A straight pastern was not wanted. The bone above the pastern need not be big, but should slope back like the shoulders of a good horse, and have a shoulder flat and wide on top, a strong, wide back, and a flat loin. The ribs should turn well out, and the rump should be flat and square to the tail. The sheep should not slope down at the rear end, but should go straight down, with plenty of bulk in the hind legs.

Constitution and adequate heart room were most essential. The neck should be set in exactly with the shoulder, and must be broad, strong, and short. The Southdown should have a flat poll and should be wide and flat between the ears and eyes, with the face not too long, and broad, open, wide nostrils. The under jaw should be deep and strong, coming up square with the teeth, neither undershot nor overshot. Either of these defects was a culling point.

In Southdown rams, Mr. Wheeler observed, there should be colour and expression in the face. The approved colour was a soft- mousy tint. It might be darker or lighter, but should be even on head and feet. The poll should carry no horns. The ears should be not too large, with a nice "handle." The flesh should be soft but firm. Really spongy flesh meant fat. The wool of the Southdown was a secondary consideration from the utility point of view, but must be dense. It should be fine and even all over. The sheen of the skin when the wool was opened was very important. On any young sheep a real baby pink should be disclosed when the wool was opened.

Soy Beans—Limitations under Local Conditions.

The following notes on soy bean trials in New South Wales are of interest to Queensland farmers:—

Soy beans have long been a staple food producet of eastern countries, and have assumed considerable importance in the United States in view of the multiplicity of uses to which they can be put. In these countries their cultivation presents no difficulty. Realising the possibilities of such a legume in this State, either as a green manure crop, as hay or green feed, or for the many uses for which the grain may be utilised, the Department of Agriculture introduced soy beans into New South Wales many years ago. Many varieties have been introduced in the last twenty years and numerous field trials have been conducted in all parts of the State.

The results in the main, however, have been disappointing, and efforts to establish soy beans as a commercial crop have met with little success. The growth has been erratic—at times luxuriant but more often medium to poor; while grain yields, chiefly as a result of poor seed setting due primarily to some unfavourable climatic influence, have been low. A factor that is also responsible for the unsatisfactory growth appears to be the absence in our soils of the particular bacteria associated with the growth of nodules on the roots of the plants. This is substantiated by recent experiments at New England Experiment Farm, Glen Innes, where two strains of commercial inoculum from the United States gave an increase of six bushels over seed not inoculated.

As a summer legume for green manuring, soy beans are inferior to cowpeas on the coast, and they do not produce nearly the same bulk over a series of years. For this purpose, however, they should have some value on the Tablelands. On the Murrumbidgee Irrigation Area also they should be useful as a rotation crop, particularly with rice.

As a green fodder, although the growth has been generally satisfactory, it is difficult to find a place for them. There is usually an abundance of green feed at the time of the year at which they are available, and other legumes such as lucerne or cereals such as maize or sorghum are much more satisfactory. In some inland localities where maize is grown on river flats, as at Gundagai, Tumut, &c., and sheep are turned into the crop when it is reaching maturity to eat down weed growth, soy beans could be sown with advantage owing to their high feeding value.

In recent years the value of soy beans for human diet has received a good deal of prominence, and this has led to numerous inquiries regarding their cultivation for grain. From this standpoint the New England Tablelands has given the best results, although in wet seasons such as that of 1933-34 the crop has proved almost a failure in this respect. Rabbits and hares also have a particular liking for soy beans in their young stages of growth, and it is quite useless to attempt their cultivation in anything but well-netted areas where these pests are prevalent. Apart from the difficulty which considerable experience has shown exists in securing payable yields, soy beans can be imported so cheaply from the East, owing to cheap labour conditions, &c., that it is very apparent that they cannot be regarded at present as a commercially profitable crop to grow for grain in this State.

It will be seen from the foregoing that while under local conditions soy beans appear to have considerable limitations there are, nevertheless, districts in which they might well be introduced into the farming programme.

To Pull Out Stumps.

When pulling out a stump with a chain and team only, hook the chain round the bottom of the stump, not the top, with the hook on the opposite side to the team, and pass the chain over the top of the stump. This gives a leverage and increases the pulling power. A better way, with a little grubbing, is to get the chain round a big root, and pass over the tops of the stump as before.

To Square the Corner.

To square the corner when plotting out the site for a paddock or building, lay a 4-feet straightedge along one line from the corner peg, and another of 3 feet along the adjacent side. Then bring their ends exactly 5 feet apart and you will have a perfect right angle. From the height and base of the angle the sides may then be lined out.

PLATE 164.—ON COOCHIN COOCHIN, FASSIFERN DISTRICT, Q.

PLATE 165.—THE HOMESTEAD PADDOCK.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

A MODEL SCHOOL.

I have recently enjoyed the privilege of visiting one of the oldest schools in Sydney—so old that one saw there something very rare in this young country—a flight of stone steps worn into grooves by the feet of many generations of small children. There I spent a delightful hour watching a form of education wholly new to me. It was not kindergarten, although it resembled this in spirit. These children of six to eight years were not playing games; they were performing tasks, but they were performing them spontaneously; they wished to learn, and even the most dull were helped forward by the pervading atmosphere of their comrades and their teachers. I have never seen children under more perfect control, and yet they had no notion that they were under any sort of discipline. A very thorough and practical knowledge of child psychology could be seen working with perfect smoothness. The power of positive suggestion was never better exemplified; there seemed to be no "don'ts" in this school. A small class of a dozen or fifteen children would sit on a mat in front of the teacher, who talked to them in a quiet voice asking questions and suggesting answers, her eyes glancing from one child to another, keeping them all in direct mental contact. After fifteen or twenty minutes the strain was relaxed, and the class dispersed for individual study. Each in his or her little chair was engaged in some pleasing task. Some were learning arithmetic by the aid of various devices, some were writing or drawing, some figuring with firm strokes of chalk on a blackboard, some reading. One little girl next to me was reading a small picture-book about a pup, not as a conscious task, but evidently because she wanted to know all about that pup.

In schools, even in well-to-do districts, one expects to see a percentage—sometimes a considerable percentage—of poorly-nourished children. Here I saw none. I was struck by the good nutrition and physical condition of these children, more especially as this school was situated in one of the poorest districts of Sydney. Indeed, this was the special reason for my visit. I was told that their health had not always been so good. There had been a careful investigation in 1921, and it was then found that 25 per cent. of the children were below standard weight.

The Health Game.

In that year was instituted the "Health Game." This was to be no formal instruction. Sickness was never mentioned. The whole stress was to be laid on "health, strength, joy." The children were informed that on a certain day at a certain hour a new game would be started. At the fixed time they all assembled in the hall full of expectation,, and the game was explained. Each child could join in as he or she pleased.

Points in the game could be scored daily—one for a bath, one for brushing the teeth, one for eating green vegetables, one for living in a room with the windows open, and so on. A meeting of the mothers was called, and the game explained to them. It caught on. Even the fathers were drawn in. One navvy was observed walking home carrying a bath. He walked into the kitchen and dumped it on the floor, saying, "Here's your damned bath," while the children cried out with glee, for now each could score another point daily.

Healthy Food.

Members of a dairy farmers' co-operative company were drawn into the health game. They thought it would be good business to provide this school of poor children with twenty pints of the best pasteurised milk daily as an experiment. The experiment was a great success. After six months all the under-nourished children had reached normal weight or more.

I watched the children taking their milk at half-past ten. Each child had a half-pint bottle, or one-third of a pint for some of the smallest, and a straw. Drinking the milk was perfectly voluntary, but each child emptied its bottle slowly, then rinsed the bottle, and put it in the rack for removal. I then visited the lunch room, where two volunteers were preparing the health lunch to be taken later in the day. Wholemeal bread was being cut into sandwiches with egg, cheese, tomatoes, plenty of fresh lettuce, &c.

This model school shows what is possible. I wish there were more like it.

IN THE FARM KITCHEN.

COOKING VEGETABLES.

All recipes are on the basis of six servings.

Spinach.

Spinach, salt, butter, hard cooked eggs.

(1) Wash spinach in several waters.
(2) Discard the stems and put leaves in a saucepan.
(3) Cover saucepan closely and cook gently for about thirty minutes. (It may be necessary to add a little water.)
(4) When spinach is tender add salt.
(5) Drain and chop fine.
(6) Add butter and serve garnished with hard cooked eggs.

Baked Squash.

Squash, butter, pepper, and salt.

(1) Cut squash in halves.
(2) Remove seeds and stringy parts.
(3) Place in a pan with a little water.
(4) Cover pan and steam in the oven until tender (about two hours).
(5) Remove from shell, mash, and season with butter, salt, and pepper.

Glazed Onions.

One dozen butter onions, 3 tablespoons butter, 2 tablespoons sugar.

(1) Peel onions and prick.
(2) Cook in boiling salted water for fifteen minutes (1 teaspoon to 2 cups water).
(3) Drain and dry on a cloth.
(4) Melt butter and add sugar.
(5) Add onions and simmer gently for twenty to thirty minutes, basting occasionally.

Escalloped Potatoes.

Four medium potatoes (raw), 1 teaspoon salt, ¼ teaspoon pepper, 1 tablespoon butter, 2 teaspoons flour, 1 cup hot milk.

(1) Cut peeled potatoes into ¼-inch slices.
(2) Put a layer of potatoes in a buttered baking dish.
(3) Sprinkle with salt and pepper.
(4) Dredge with flour and dot with butter.
(5) Repeat.
(6) Add hot milk until it may be seen through top layer of potatoes.
(7) Bake for one and a-quarter hours or until soft.

Creamed Potatoes.

Two cups cold boiled potatoes, 2 tablespoons butter, 1 tablespoon chopped onion, 1 tablespoon flour, 1 cup milk, 1 tablespoon chopped parsley.

(1) Melt butter in saucepan.
(2) Add onion and cook until slightly browned.
(3) Add flour, stir well.
(4) Add milk and stir until sauce thickens.
(5) Add potatoes cut in cubes, and cook until potatoes are heated through.
(6) Turn into a hot dish.
(7) Sprinkle with parsley and serve.

Glazed Sweet Potatoes.

Six medium sized sweet potatoes, ¼ cup butter, ¼ cup water, 2 tablespoons sugar.

(1) Boil sweet potatoes until soft.
(2) Cut in halves and lay evenly in baking dish.
(3) Pour over the potatoes a syrup made of butter, sugar, and water.
(4) Bake in a hot oven until tender and nicely browned.

Harvard Beetroot.

Three medium sized beetroot, ½ cup sugar, 2 tablespoons butter, ½ teaspoon maizena, ½ cup vinegar.

(1) Cook beets until soft.
(2) Peel and cut in cubes.
(3) Mix sugar and maizena.
(4) Add vinegar and boil mixture for five minutes.
(5) Pour over beets and let stand on the back of the stove for half an hour.
(6) Just before serving, add the butter.

Mint Glazed Carrots with Peas.

Three medium sized carrots, 3 tablespoons butter, ½ cup sugar, 1 tablespoon chopped fresh mint, 1 cup boiled peas.

(1) Wash, scrape, and cut carrots into ¼-inch slices.
(2) Cook in boiling salted water fifteen minutes.
(3) Drain and put into a saucepan with butter, sugar, and mint.
(4) Cook slowly until soft and glazed.
(5) Heat the peas and season with butter, salt, and pepper.
(6) Turn peas on hot serving dish and surround with carrots.

Cauliflower.

One medium sized cauliflower, 1 tablespoon butter, 1 tablespoon flour, ½ teaspoon salt, 1 cup milk, ½ cup breadcrumbs.

(1) Cut stalk close to cauliflower and remove the green leaves.
(2) Soak in salted water for one hour (1 tablespoon salt to 1 gallon water).
(3) Cook in boiling water twenty to thirty minutes.
(4) Place in a hot serving dish and pour over white sauce.
(5) Sprinkle with breadcrumbs mixed with melted butter.
(6) Heat in oven until crumbs are brown.

White Sauce.

(1) Melt butter in saucepan.
(2) Add flour and salt.
(3) Blend well and add milk.
(4) Cook until thick and creamy.

Escalloped Cabbage.

One small head cabbage, 3 cups stale breadcrumbs, 1 tablesepoon butter, 1½ teaspoons salt, ⅛ teaspoon pepper, milk.

(1) Chop the cabbage fine.
(2) Cover the bottom of a buttered baking dish with cabbage.
(3) Put a layer of breadcrumbs.
(4) Continue alternately until dish is two-thirds full.
(5) Sprinkle crumbs on top, dot with butter.
(6) Add salt and pepper to milk and barely cover cabbage in dish.
(7) Bake in a moderate oven for forty-five minutes or until cabbage is tender.

POINTS IN PAINTING FARM BUILDINGS.

PREPARATION OF THE SURFACE.

The proper preparation of surfaces for painting is more important than is generally supposed. They should be smooth and clean—quite free, that is, of dust, moisture, smoke stain, or any matter foreign to the paint or the material to be painted. To make surfaces smooth calls for the removal of excrescences or the filling of voids, and each of the following will have its special use:—Sandpaper (fine and middle 2), steel wool No. 2, patent pumice stone, and also a putty knife. An artisan's equipment would include a blow-lamp for the removal of cracked or peeling paint, &c. The risk of fire, however, might make this dangerous in the hands of an amateur if used on a weatherboard structure.

Knots and veins that exude gum should be smoothed off and given a coat of shellac or patent knotting. Holes should be stopped with putty (this consists of whiting and linseed oil), but not until the priming coat has been applied.

Moisture is one of the greatest destroyers of paint. It may be in the timber (unseasoned timber) or on the surface in the form of condensation, in which case, particularly in kitchens where gas fumes from the stove condense upon cold surfaces, it may contain sulphur, which is a great destroyer of white-lead paint.

Tacky paint can be successfully prepared for painting by coating it with lime-water (not limewash). The water in which lime has been slaked will, if allowed to stand for some time, become quite clear. It is this clear water that should be used.

Smoky ceilings and walls should, if extremely dirty, be first washed with water and soda. If in fair condition a coat of lime-water will suffice. Rub down between each coat of paint to remove excrescences. Remove dirt from corners, quirks of mouldings, &c., with putty knife, and always use the dusting brush well in advance of the painting.

Orchard Notes for May.

THE COASTAL DISTRICTS.

In these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally as important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ inches in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of blue-mould infected or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one-sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month, and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Clean up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place, as, if delayed till the pruning has been finished, the land is apt to dry out.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt

district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manure—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland, and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

Farm Notes for May.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late-maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland. Prairie grass seed should be treated with formalin or a reliable mercury dust before sowing.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1935.	Feb., 1934.
North Coast.	In.		In.	In.
Atherton	10·60	34	7·63	18·80
Cairns	15·71	53	14·94	22·75
Cardwell	16·72	63	10·72	12·96
Cooktown	13·77	59	6·49	21·42
Herberton	7·97	49	4·64	19·07
Ingham	16·04	43	7·95	16·69
Innisfail	22·47	54	16·21	28·45
Mossman Mill	18·21	22	11·48	33·95
Townsville	11·15	64	0·60	14·19
Central Coast.				
Ayr	8·94	48	2·51	12·57
Bowen	8·72	64	4·98	12·69
Charters Towers	4·45	53	2·15	7·02
Mackay	11·39	64	16·59	11·76
Proserpine	12·00	32	17·41	14·22
St. Lawrence	7·85	64	3·19	11·76
South Coast.				
Biggenden	4·52	36	3·09	11·29
Bundaberg	6·65	52	6·32	19·26
Brisbane	6·41	84	5·59	16·16
Caboolture	7·93	48	7·28	16·95
Childers	6·92	40	4·22	21·54
Crohamhurst	13·07	42	16·03	18·11
Esk	5·59	48	3·91	8·96
Gayndah	4·28	64	5·15	8·58
Gympie	6·85	65	8·35	18·83
Kilkivan	5·02	56	3·04	12·91
Maryborough	6·87	64	7·04	21·16
Nambour	9·76	39	15·64	15·62
Nanango	4·14	53	3·49	5·45
Rockhampton	7·82	64	3·79	16·27
Woodford	8·59	48	9·28	13·21
Central Highlands.	In.		In.	In.
Clermont	4·27	64	1·08	6·13
Gindie	2·82	36	..	6·13
Springsure	3·92	66	1·09	3·56
Darling Downs.				
Dalby	2·89	65	1·47	4·42
Emu Vale	2·55	39	3·86	2·46
Hermitage	2·53	29	1·25	3·19
Jimbour	2·68	47	2·49	4·48
Miles	2·75	50	0·36	4·82
Stanthorpe	3·20	62	3·15	2·53
Toowoomba	4·60	63	3·67	10·8[illegible]
Warwick	3·08	70	2·84	3·3[illegible]
Maranoa.				
Roma	2·91	61	0·97	3·60
State Farms, &c.				
Bungeworgoral	2·22	21	0·75	3·62
Gatton College	3·53	36	5·98	6·56
Kairi	9·99	21	7·79	14·51
Mackay Sugar Experiment Station	10·36	38	15·44	9·28

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—FEBRUARY, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·74	93	71	102	14, 16	66	4	649	8
Herberton	..	87	65	96	16	59	7, 11, 20	464	19
Rockhampton	29·82	93	73	100	15	68	28	379	15
Brisbane	29·90	86	70	93	19	64	3	559	19
Darling Downs.									
Dalby	29·87	89	63	98	19	52	3	147	5
Stanthorpe	..	81	57	90	5, 19	41	3	315	11
Toowoomba	..	84	63	93	19	56	3	367	11
Mid-Interior.									
Georgetown	29·77	97	74	104	18	62	11	279	6
Longreach	29·78	103	72	111	16, 19	62	11, 26	36	4
Mitchell	29·84	96	65	105	19	52	3, 10	9	3
Western.									
Burketown	29·76	98	78	106	15	67	1	224	4
Boulia	29·79	102	76	113	16, 17	66	10, 11	..	..
Thargomindah	29·84	96	71	108	18	59	10, 11	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April. 1935.		May. 1935.		MOONRISE. Apr., 1935.	MOONRISE. May., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·2	5·50	6·18	5·20	3·9	4·11
	6·3	5·49	6·18	5·19	4·17	5·17
3	6·3	5·48	6·19	5·18	5 23	6·22
4	6·4	5·46	6·20	5·17	6·29	7·27
5	6·4	5·45	6·20	5·17	7·34	8·29
6	6·5	5·44	6·21	5·16	8·41	9·27
7	6·5	5·43	6·21	5·15	9·45	10·19
8	6·6	5·42	6·22	5·14	10·45	11·5
9	6·6	5·41	6·23	5·14	11·39	11·45
					p.m.	p.m.
10	6·7	5·40	6·23	5·13	12·27	12·20
11	6·7	5·39	6·24	5·12	1·11	12·51
12	6·8	5·38	6·24	5·11	1·48	1·19
13	6·8	5·37	6·25	5·11	2·20	1·48
14	6·9	5·36	6·26	5·10	2·51	2·17
15	6·9	5·35	6·26	5·10	3·18	2·49
16	6·9	5·35	6·27	5·9	3·48	3·22
17	6·10	5·34	6·27	5·9	4·18	3·59
18	6·10	5·33	6·28	5·8	4·48	4·43
19	6·11	5·32	6·29	5·8	5·24	5·37
20	6·11	5·31	6·29	5·7	6·5	6·33
21	6·12	5·30	6·30	5·7	6·51	7·35
22	6·12	5·29	6·30	5·6	7·44	8·38
23	6·13	5·28	6·31	5·6	8·40	9·45
24	6·14	5·26	6·32	5·5	9·42	10·51
25	6·14	5·25	6·33	5·5	10·46	11·55
26	6·15	5·24	6·33	5·4	11·53	a.m.
27	6·15	5·24	6·34	5·4	a.m.	12·58
28	6·16	5·23	6·34	5·3	12·57	2·0
29	6·16	5·22	6·35	5·3	2·2	3·2
30	6·17	5·21	6·35	5·2	3·5	4·7
31			6·36	5·2		5·14

Phases of the Moon, Occultations, &c.

3 April	● New Moon	10 11 p.m
11 ,,	☾ First Quarter	3 42 a.m.
19 ,,	○ Full Moon	7 10 a.m.
26 ,,	☽ Last Quarter	2 20 p.m.

Perigee, 2nd April, at 6.12 a.m.
Apogee, 14th April, at 5.48 a.m.
Perigee, 30th April, at 2.0 a.m.

At 10 a.m. on the 6th the young Moon and Venus will be within 4 degrees of each other, the Moon having risen 22 degrees north of east 1 hour 19 minutes earlier.

Mars on the 6th will be in opposition to the Sun, rising only 7 minutes after the Sun has set.

At 5 a.m. on the 21st the Moon will be passing 6 degrees south of Jupiter when both are prominent objects in the north-west about an hour and a quarter before sunrise.

On the 27th the quickly moving planet Mercury, being in superior conjunction with the Sun, will be lost in its rays, at a distance (momentarily) of 123,555,243 miles from the Earth.

When the Moon rises 4½ degrees south of east at 2.2 a.m. on the 29th, Saturn will be only 5 degrees south of it, becoming more observable as they rise higher till they fade into the coming daylight.

Mercury rises at 4.18 a.m., 1 hour 44 minutes before the Sun, on the 1st; on the 15th it rises at 4.59 a.m., 1 hour 10 minutes before the Sun.

Venus sets at 7.23 p.m., 1 hour 33 minutes after the Sun, on the 1st; on the 15th it sets at 7.25 p.m., 1 hour 50 minutes after the Sun.

Mars rises at 6.17 p.m. and sets at 6.41 a.m. on the 1st; on the 15th it rises at 5.5 p.m. and sets at 5.23 a.m.

Jupiter rises at 7.59 p.m. and sets at 9.21 a.m. on the 1st; on the 15th it rises at 6.52 p.m. and sets at 8.36 a.m.

Saturn rises at 3.22 a.m. and sets at 4.16 p.m. on the 1st; on the 15th it rises at 2.31 a.m. and sets at 3.27 p.m.

The Moon's path in April, commencing at 8 p.m., will be in Aquarius on the 1st; in Pisces from the 2nd to the 4th; in Aries on the 4th and 5th; in Taurus from the 5th to 9th; in Gemini to 11th; in Cancer to 13th; in Leo to 16th, passing Regulus at 1 p.m. on the 14th, about 3 degrees south of it; in Virgo on the 19th, passing 4 degrees south of Spica, when full, at 4 a.m. on that date; it will be in Libra to the 21st and in Scorpio on the 21st; in Orphiucus to the 23rd (about 5 degrees north of Scorpio); in Sagittarius to the 25th; in Capricornus to 27th; again in Aquarius to the 29th; and in Pisces on the 30th.

3 May	● New Moon	7 36 a.m.
10 ,,	☾ First Quarter	9 54 p.m.
18 ,,	○ Full Moon	7 57 p.m.
25 ,,	☽ Last Quarter	7 44 p.m.

Apogee, 12th May, at 12.18 a.m.
Perigee, 26th May, at 2.30 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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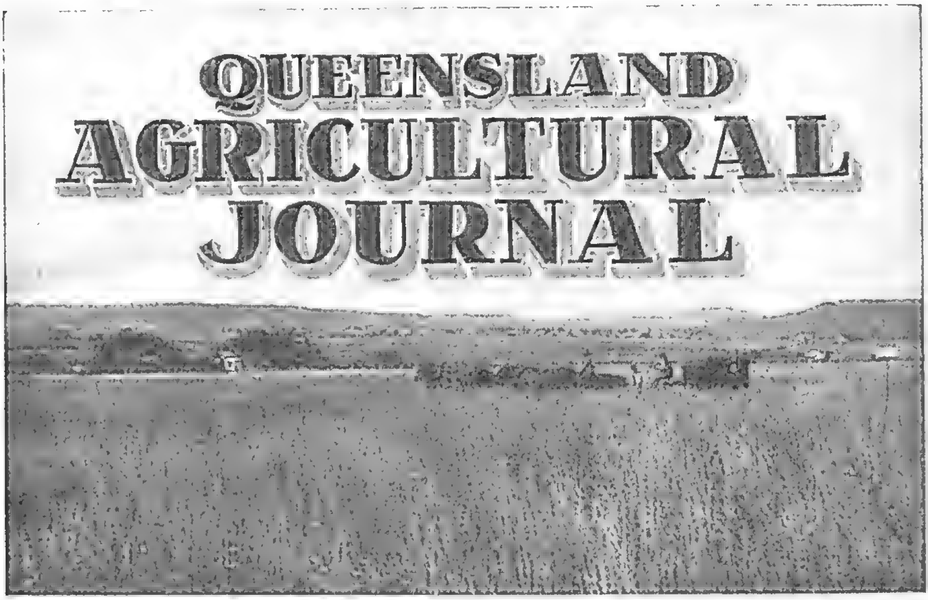


VOL. XLIII. 1 MAY, 1935. PART 5

Event and Comment.

Anzac.

WITH Australians, the Story of Anzac has grown into a great tradition, and the twentieth anniversary of the Gallipoli Landing (25th April) was commemorated with fitting ceremony throughout the Commonwealth. It is a great and inspiring story, and who has told it like John Masefield?

> "On Friday, the 23rd of April, the weather cleared so that the work could be begun. In fine weather in Mudros a haze of beauty comes upon the hills and water till their loveliness is unearthly, it is so rare. Then the bay is like a blue jewel, and the hills lose their savagery, and glow, and are gentle, and the sun comes up from Troy, and the peaks of Samothrace change colour, and all the marvellous ships in the harbour are transfigured. The land of Lemnos was beautiful with flowers at that season, in the brief Ægean spring, and to seawards always, in the bay, were the ships, more ships, perhaps, than any port in modern times has known; they seemed like half the ships of the world. . . .

> "Ship after ship, crammed with soldiers, moved slowly out of harbour in the lovely day, and felt again the heave of the sea. No such gathering of fine ships has ever been seen upon this earth, and the beauty and the exultation of the youth upon them

made them like sacred things as they moved away. All the thousands of men aboard them gathered on deck to see, till each rail was thronged. These men had come from all parts of the British world—from Africa, Australia, Canada, India, the Mother Country, New Zealand, and remote islands in the sea. They had said good-bye to home that they might offer their lives in the cause we stand for. In a few hours at most, as they well knew, perhaps a tenth of them would have looked their last on the sun, and be a part of foreign earth or dumb things that the tides push. Many of them would have disappeared forever from the knowledge of man, blotted from the book of life none would know how—by a fall or chance shot in the darkness, in the blast of a shell, or alone, like a hurt beast, in some scrub or gully, far from comrades and the English speech and the English singing. And perhaps a third of them would be mangled, blinded or broken, lamed, made imbecile or disfigured, with the colour and the taste of life taken from them, so that they would never more move with comrades nor exult in the sun. And those not taken thus would be under the ground, sweating in the trench, carrying sandbags up the sap, dodging death and danger, without rest or food or drink, in the blazing sun or the frost of the Gallipoli night, till death seemed relaxation and a wound a luxury. But as they moved out these things were but the end they asked, the reward they had come for, the unseen cross upon the breast. All that they felt was a gladness of exultation that their young courage was to be used. They went like kings in a pageant to the imminent death. As they passed from moorings to the man-of-war anchorage on their way to the sea, their feeling that they had done with life and were going out to something new welled up in those battalions; they cheered and cheered till the harbour rang with cheering. As each ship crammed with soldiers drew near the battleships, the men swung their caps and cheered again, and the sailors answered, and the noise of cheering swelled, and the men in the ships not yet moving joined in, and the men ashore, till all the life in the harbour was giving thanks that it could go to death rejoicing. All was beautiful in that gladness of men about to die, but the most moving thing was the greatness of their generous hearts.

". . . . They left the harbour very, very slowly; the tumult of cheering lasted a long time; no one who heard it will ever forget it, or think of it unshaken. It broke the hearts of all there with pity and with pride; it went beyond the guard of the English heart. Presently all were out, and the fleet stood across for Tenedos, and the sun went down with marvellous colour, lighting island after island and the Asian peaks, and those left behind in Mudros trimmed their lamps, knowing that they had been for a little time brought near to the heart of things."

To-day the pilgrim's eyes are on the dimly purple peaks of Samothrace and his thoughts are with Rupert Brooke, and those who fought and died with him:

> . . . These laid their world away; poured out the red
> Sweet wine of youth; gave up the years to be,
> Of work and joy, and that unhoped serene
> That men call age; and those who would have been
> Their sons, they gave their immortality.

Certificated Milk.

OPENING a certificated dairy near Brisbane in the course of the month, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that the certification of a dairy meant that there must be continuous attention to details of dairy hygiene and a considerable amount of expenditure in time, money, and labour.

Milk, remarked the Minister, was greatly depreciated in value if it contained foreign bodies, and certification placed milk beyond suspicion. In America certificated milk allowed of a bacterial count of 10,000 organisms to the cubic centimetre, but the milk supplied by the dairy he was opening officially contained only 4,000 organisms to the cubic centimetre. One of the major pathological problems associated with milk supply was tuberculosis, and, though the medical profession declared that cases of bovine tuberculosis in adults was rare, 5 per cent. of tuberculosis amongst children was bovine in origin. The solution of that problem was the exclusion of tubercular cows from herds supplying milk for domestic purposes. In a certificated dairy every cow must measure up to the health standard laid down by his department; every animal was certified to be free from major disease.

"I hope," said the Minister, "that the time is not far distant when we shall see many certificated milk carts on the streets of Brisbane. Certificated milk is guaranteed above suspicion by the State and the medical services of the State. It is a scheme that should appeal to parents, and particularly to parents of delicate children. There is no food that can take the place of milk with its admirable food balance and vitamin content."

That afternoon's ceremony was an occasion to which he had looked forward for three years, declared Dr. D. Gifford Croll, a member of the State Animal Health Board. Mr. Bulcock was to be congratulated on being the Minister to inaugurate the scheme. It had been demonstrated that pure milk could be sold at no higher a price than that ruling for other milk and at no great capital outlay.

A Model Dairy.

THE white bails of the model dairy opened by Mr. Bulcock have sloping concrete floors that are kept scrupulously clean throughout the time that the cows are being milked. Surrounding this building are lawns and sweeping gravelled drives. When the cows are driven into the bails a boy, who does none of the milking, wipes the flanks and the udder of each cow with a dry cloth, and then wipes each udder with a damp cloth suitably disinfected. The milk, after being drawn, is cooled to a temperature of 45 degrees, claimed to be the ideal temperature for delivery. To preserve the temperature special insulated cans—constructed on the principle of a thermos bottle—are used on the carts to ensure the delivery of the milk at a temperature not higher than 50 degrees, thus preserving quality. These carts, to which special attention was drawn by the Minister, are painted white, with a broad blue band—the badge of a certificated milk cart. Each of them is fitted with a special metal covering over the taps to prevent dust contamination. Night and day the members of the dairy staff wear special washing uniforms, and they are compelled to wash their hands in disinfectant after each cow has been milked, and the roller towel which they use must be changed after every twelve cows.

The Brown Vegetable Weevil.

By ROBERT VEITCH, B.Sc. Agr., B.Sc. For., F.R.E.S., Chief Entomologist.

THE brown vegetable weevil is a comparatively recent arrival in Australia, but in the last few years it has become firmly established in Queensland, each year witnessing a steady increase in the infested territory. It has a very wide range of host plants, those most favoured being potatoes and tomatoes, although it also shows a marked partiality for tobacco seedlings, carrots, beans, lettuce, turnips, parsnips, cabbages, and cucumbers. Flowering plants such as the chrysanthemum and the cineraria are also attacked, while cape weed is one of the favourite weed host plants. The destructive activities of this species are manifested mainly in the winter and spring months in this State, both the larvæ and the adults feeding on the selected host plants, the attack by the beetles being more serious than the larval infestation.

Life History and Habits.

The weevil (Plate 166, figs. 4 and 5) is one-third of an inch in length and is a greyish-brown beetle possessing two obliquely placed greyish white patches on the back which form a distinct V-shaped mark. The eggs laid by the beetles in autumn and early winter hatch into legless larvæ, which at first feed only on one surface of the foliage, generally the under surface. As they grow, however, irregularly shaped holes are eaten in the leaves (Plate 166, fig. 6). A feature of the infestation is that the larvæ which shelter during the day characteristically feed at night, although a few may be seen feeding in sheltered spots on plants in the daytime. The full grown larva (Plate 166, fig. 1) is pale green with a brown head and measures roughly one-third of an inch in length, an important feature being the presence on the head of short dotted darker lines which serve to distinguish this larva from that of another somewhat similar species. The full grown larva pupates in the soil in an earthen cell (Plate 166, fig. 2), wherein it transforms to a pale green pupa (Plate 166, fig. 3), which eventually gives rise to a typical weevil possessing a long downwardly protruding snout. The beetles shelter in the soil by day and feed voraciously by night on the foliage, generally leaving only the leaf stalks when they are at all numerous, although even these may be destroyed. The bulbs of carrots and turnips (Plate 166, fig. 7) may also be attacked.

Control.

When infestation occurs on potatoes spraying or dusting with arsenate of lead will be found effective against this pest. However, the arsenate of lead sprays or dusts generally cannot be directly applied for the control of the brown vegetable weevil because most of its host plants would then carry undesirable spray residues on the parts to be used for food. Furthermore, in the case of tobacco seedlings many of the young plants would have so much foliage destroyed before the larvæ or beetles obtained a lethal dose of the arsenical that they would be severely weakened or even succumb to the attack; hence for the control of brown vegetable weevil the general practice is to employ a type of baiting by using foliage of cape weed or tops cut from tomatoes or other attractive plants that have passed the productive stage. These

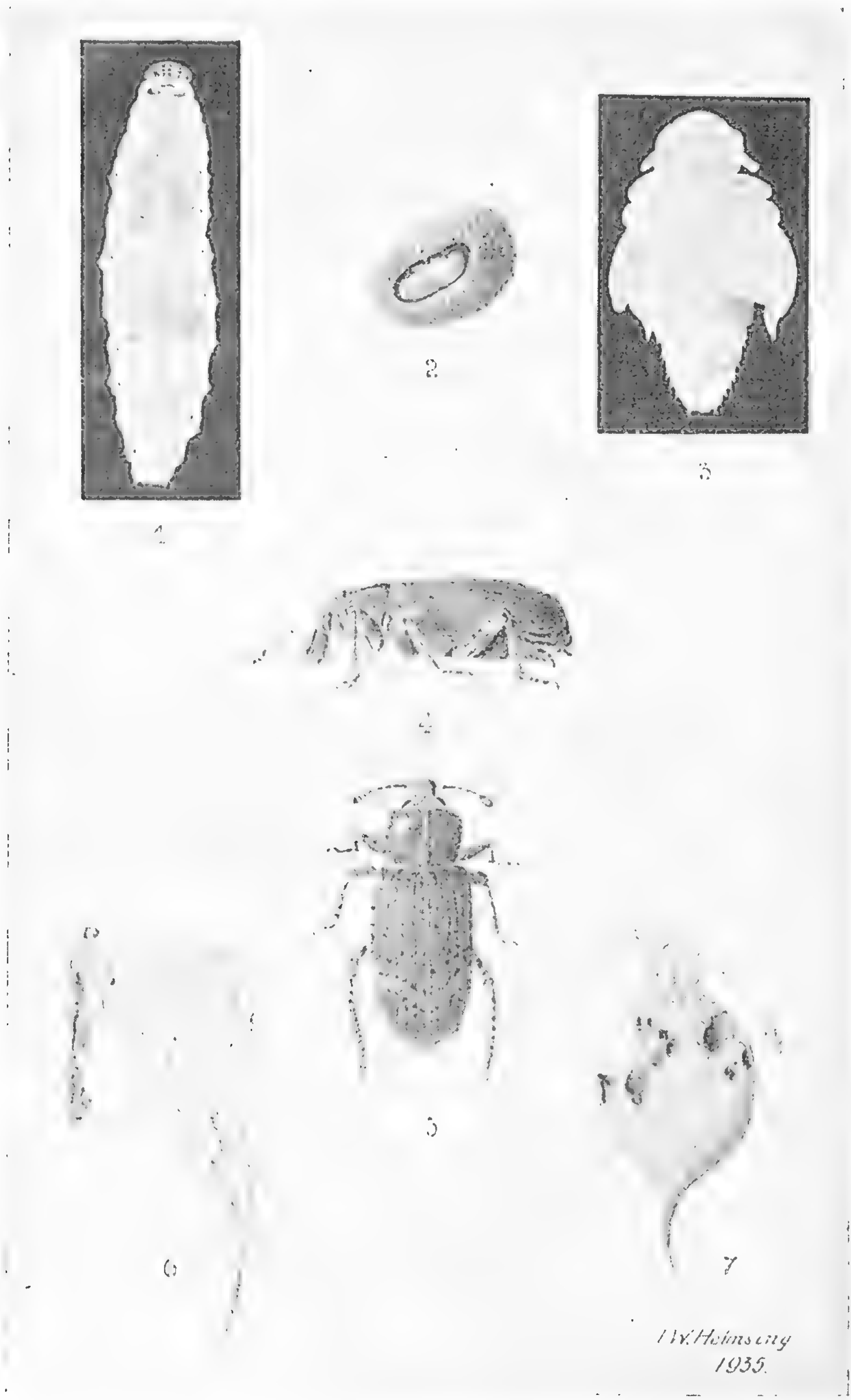


Plate 166.

Brown Vegetable Weevil.

Fig. 1.—Larva $\times 4\frac{1}{2}$.
Fig. 2.—Pupa in earthen cell, natural size.
Fig. 3.—Pupa $\times 4\frac{1}{2}$.
Fig. 4.—Adult, lateral view, $\times 4\frac{1}{2}$.
Fig. 5.—Adult, dorsal view, $\times 4\frac{1}{2}$.
Fig. 6.—Damage to young lettuce plant by larvæ, half natural size.
Fig. 7.—Damage to white turnip by adults, half natural size.

should be dipped in an arsenate of lead solution and placed between the rows of plants requiring protection or placed in the vicinity of seed-beds suffering from infestation. As in the case of cutworm baits these succulent tops for the control of the brown vegetable weevil should be distributed in the late afternoon so that they will be fresh and attractive when the beetles and larvæ commence feeding at night. Should it be impossible to obtain the tops for this type of bait it is suggested that growers might use the bran bait employed for cutworm control, although it is not expected that the bran bait will give such good results against brown vegetable weevil. The destruction of weeds and rubbish in which the beetles may shelter during the summer months in the vicinity of cultivated areas or seed-beds should be productive of much good, the cleaning-up being done before the beetles go into the inactive summer stage. Should heavy breeding be taking place on weed host plants in the vicinity of cultivated host plants it is probably worth while to spray or dust the weed host plants with arsenate of lead, thereby destroying many brown vegetable weevils which would probably migrate to the cultivated plants at a later date. A further control method that is worthy of consideration is the cultivation of infested land during the winter and early spring months when many of the brown vegetable weevils are in the soil in the prepupal or pupal stage at a depth of 1 or 2 inches below the surface. Such cultivation of infested land not then under profitable crops should lead to the destruction of many pupæ and prepupæ, thereby greatly reducing the number of beetles emerging in the spring months. The exact time of the ploughing should be determined after an examination of the soil to ascertain the extent to which pupation has taken place, the operation being most effective when the maximum number of pupæ and prepupæ are present.

PASPALUM—ADVANTAGES OF TOP-DRESSING.

Top-dressing ploughed paspalum pastures with fertilizers has been found very beneficial, and is also recommended where ploughing is impossible, but the use of the paspalum cultivator is practicable. The use of fertilizers, such as superphosphate, stimulates the growth of grasses and legumes, and the amount of mineral matter in the plants is increased, particularly the elements lime and phosphorus, which are essential for the animal's development.

Ground carbonate of lime at the rate of 10 cwt. per acre applied in the autumn of every third year and 2 cwt. superphosphate per acre each year is recommended for the top-dressing of paspalum pastures. The superphosphate should be used in two dressings—1 cwt. in the autumn and the remainder in the early spring.

Unploughed paddocks to be top-dressed must first be fed down closely, raked or harrowed to remove dead grass and other rubbish, and the matted crown of the grass should then be torn by the use of suitable grass cultivators or grass harrows. It is useless to apply fertilizer until the matted surface is properly opened up.

At a number of centres in north coast district, on country where it is impossible to plough, good results are obtained from top-dressing paspalum as detailed above. The first application of the fertilizer should be made after working the area with a special grass cultivator, or paspalum renovator, and preferably following a good fall of rain.

A harrow, preferably a tripod and chain harrow of good penetrative power, should be used frequently on the pasture to break up and spread the animal droppings, and also create a mulch on the surface soil.—A. and P. Notes, N.S.W. Dept. Agric.

The Pinhole Borer of North Queensland Cabinet Woods.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

DURING the past thirty years the rain-forest timbers of North Queensland have been spasmodically felled and used chiefly for ordinary structural building work. Their real value is now better appreciated both in Australia and overseas, and many commercial species with an attractive pattern are to-day chiefly used in the manufacture of veneer or as important elements in the indoor panelling favoured by modern tastes. Suitable woods for these purposes are not common, and the steady demand for some species has forced prices up to a level at which wastage of any kind is a significant loss to the manufacturer. This is particularly true of mills which cut veneer, for heavy overhead expenses are incurred by the installation of elaborate machinery and the additional handling charges essential to its operation. Much of this wastage can normally be ascribed to wood-boring insects. Those species which only penetrate the sap wood may not be of any great importance, for the heart wood in a log invariably yields the most valuable veneer. The Platypodid beetle, *Crossotarsus grevilleæ* Lea, may, however, tunnel through both sap and heart woods to completely destroy logs which would otherwise be valuable for veneer purposes. This insect has therefore been studied in some detail. A progress report has already been published (Smith, 1932), and the present paper discusses the problem in the light of recently acquired information.

SYSTEMATIC POSITION, MORPHOLOGY, AND DEVELOPMENT.

Though the genus Crossotarsus is an important element in the family Platypodidæ, insects in it are less familiar than those of the type genus Platypus, representatives of which are much larger and more conspicuous. For the most part, Crossotarsan insects are small, all the known Australian species being less than 4 mm. in length. Their habits have been little studied. Froggatt (1927) mentions four species, *C. armipennis* Lea, *C. sub-pellusidis* Lea, *C. mniszechi* Chap., and *C. cavifrons* Blndf., the last two being originally described from the Malay Archipelago. With the exception of *C. armipennis* all these have been recorded from Queensland localities, and together with *C. grevilleæ* comprise the four known species in the State.

The genus has not attracted much attention from economic entomologists and few details are available for individual species. *C. armipennis* is said to be frequent on logs of the spotted irongum, *Eucalyptus maculata*, in New South Wales, but its recorded habits differ from those of *C. grevilleæ*. In North Queensland rain forests, *C. grevilleæ* is the only species in the genus of any importance, and it does not stray far from the peculiar conditions associated with the rain-forest environment.

Crossotarsus grevilleæ Lea (Plate 167, figs. 8-10) was originally described in 1914, and the description is reproduced (Proc. Roy. Soc. Vict. XXVI., p. 226, 1914) below:—

"Flavous, in part dark brown or castaneous. Head, tips of elytra and legs with rather long, sparse, pale hairs."

"Head flattened in front with some small punctures and a feeble median carina. Prothorax slightly longer than wide, sides rather strongly curved near the apex and thence gently inflated to near the base with few small but rather clearly defined punctures about the base. Interstices with small punctures, suture triangularly notched about the apex, extreme apex irregularly vertical and with several small conical-tipped projections. Length 2 mm.

"Distinguished from other Platypodids by the small size. Of two specimens examined, one has head, except mouthparts and pronotum, black. Its elytra from about the middle are castaneous but about the apex become almost black. The others have the dark parts much paler. In both, the club is infuscate.

"Host—Silky oak, *Grevilleæ robusta.*

"Locality—Queensland, C. French, junr."

In a subsequent communication after examining material from North Queensland, Lea wrote—"He (*i.e.*, French), obtained many from logs of the silky oak from Queensland, but only females" and "The male has a long process on each side of the head (Plate 167, fig. 8), and I think that the species will have to be transferred on that account to Diapus." Lea's untimely death in 1932 has prevented the complete elucidation of the systematic aspects of the problem, but the further study of the insect as an important factor in forestry losses has yielded some relevant information.

In the first place the disposition of the sexes assumed by the original description follows Chapius (1866) and is erroneous. In common with most Platypodids, the sexes (Plate 167, figs. 8-10) are morphologically distinct, being distinguishable by differences in size, in elytral pattern, and the structure of the head. Outside the log, these can be separated as follows:—

(*a*) Size, 2 mm.; apex of the elytra ornate; elytra with a castaneous tinge merging into black at the margins;

(*b*) Size, 2·5 mm.; apex of the elytra simple; elytra uniformly black in colour; mandible with a large sickle-shaped appendage projecting forwards.

These two forms subsequently share the one burrow, and field evidence indicates that the former of these is the male and not the female as hitherto supposed. This conclusion is inferred from various data, the chief contributing points being:—

(*a*) In the Platypodidæ, morphological distinctions between the two sexes are usually very marked. In most of the better known species, the larger form with simple elytra is the female, while the smaller with ornate elytra is the male. In the two comparatively large species, *Platypus australis* Chap. and *P. omnivorous* Lea, such is very definitely the case. Similar considerations should therefore apply to *C. grevilleæ.*

(*b*) The elaboration of the burrow system is discussed later in this paper. The smaller insect initiates the burrow, but is later joined by the larger form, the joint tenancy being preceded by a change in position outside the burrow. The larger insect subsequently occupies the interior

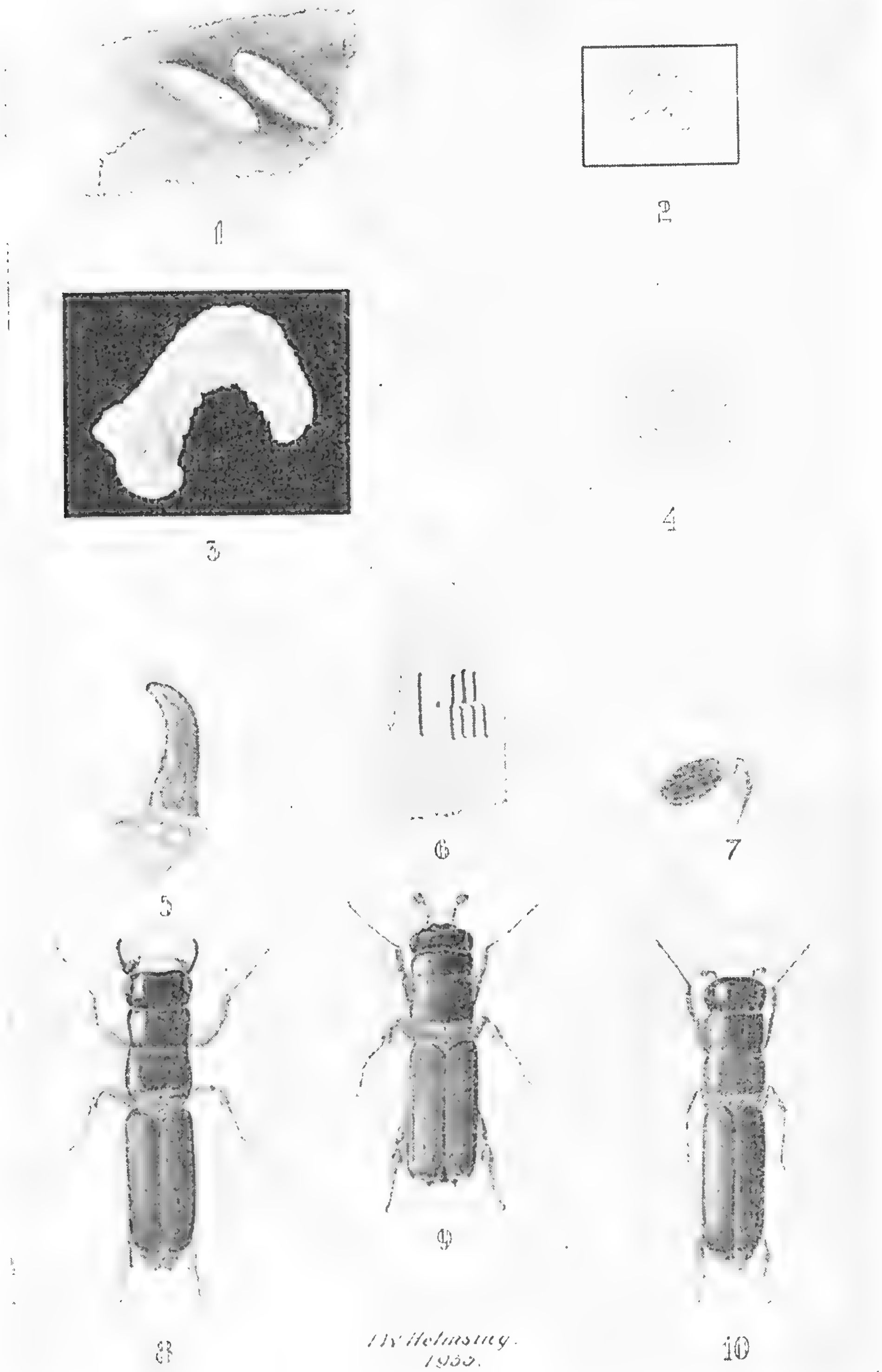


PLATE 167.

PIN HOLE BORER (*Crossotarsus grevilleæ* Lea.).

Fig. 1.—Eggs × 34.
Fig. 2.—First larval instar × 15.
Fig. 3.—Larva × 15.
Fig. 4.—Feathered setæ × 120.
Fig. 5.—Mandibular appendage × 60.
Fig. 6.—Pupal chambers, natural size.
Fig. 7.—Antenna × 60.
Fig. 8.—Adult female before boring × 15.
Fig. 9.—Adult male × 15.
Fig. 10.—Adult female after boring × 15.

of the burrow system. When the first batch of eggs is laid, no transposition of insects within the burrow is possible, and one must assume that the large form in the interior is the female on account of its egg-laying capacity.

(*c*) Miscellaneous material collected in the rain forest failed to reveal eggs or details of the sex in the two forms on dissection, largely because the separation of the internal organs of such a small insect is a difficult matter. The more careful selection of adults from burrows where egg-laying was known to be imminent facilitated the location of eggs, which were ultimately found in the internal organs of the larger insects only.

The biological data thus indicates quite definitely that of the two morphologically distinct forms, the smaller is the male and the larger the female.

Shedding of Mandibular Appendages.

Outside the log, the female possesses two forwardly projecting appendages, one attached to each of the mandibles. They are perfectly rigid, about three times the length of the mandibles and attached to the thicker basal portion. They have a sickle contour, and the inner edge is serrated, while the outer is quite smooth (Plate 167, fig. 5). The functional utility of these structures, if any, is unknown, and once the female takes an active part in the extension of the burrow system, the appendages are shed (Plate 167, fig. 10). The attachment between mandible and appendage is very secure and separation can be effected in the laboratory only with difficulty. Occasionally females are found in which one appendage has been shed while the other remains intact, suggesting that burrowing has been commenced but interrupted by predators before both have become detached. The line of the break is to be seen on the rugose anterior face of the mandible of the appendageless female.

Morphology of Immature Forms.

The immature stages have few distinctive features. The eggs (Plate 167, fig. 1) are white, elongate oval in shape, and taper slightly at one end. They are ·4 mm. in length. Within a month of the association of the sexes in the burrow, eggs are laid singly or in groups at the end point of the burrow system. The incubation period during the summer is less than one month, and eggs may be laid over an observed period of twelve months at different levels of the wood, depending on the ramifications of the burrow system.

Larvæ when first hatched (Plate 167, fig. 2) are somewhat barrel-shaped in dorsal aspect, though recurved in lateral view. Towards maturity, the three thoracic segments expand, the development of the prothorax being particularly great (Plate 167, fig. 3). The dorsum of the prothorax in the mature larva has looped chitinous areas which doubtless facilitate the movements of the insect. Mature larvæ are 4 mm. in length and the colour throughout is milk white. Semi-mature and mature larvæ are devoid of distinct setæ and thus contrast with recently hatched forms. The latter are richly setose, single setæ being regularly distributed over the body. On the dorsum of the third abdominal segment, a series of peculiar feathered setæ (Plate 167, fig. 4) occur in a transverse line, each being mounted on a small tubercle. These setæ in common with the rest clothing the body may be absent in older larvæ on which setæ persist, if at all, in truncated form.

The number of instars is largely conjectural as the larvæ cannot be observed during successive moults. Head capsule measurements, however, fall into two groups with mean widths of ·26 mm. and ·52 mm. The first group includes all the smaller forms examined, but in the second the larval lengths may vary from 1·5 mm. to 4 mm. If Dyar's hypothesis concerning the geometrical increase in head capsule size from instar to instar is applicable to this insect, two instars will be represented. Possibly an earlier instar with head capsule measurements consonant with the width of the egg can be built into the series, making a three instar development of the larvæ. This conjectural first instar has not been observed, and its duration, should it exist, must be very short.

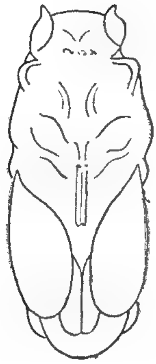
Pupæ (Plate 168, figs. 1-4) are to be found in groups of parallel chambers (Plate 167, fig. 6) on both sides of a burrow, the number of chambers in any group varying from one to as many as fifteen. Each chamber holds a single pupa. The sexes can be distinguished at this stage by their respective lengths and the presence or absence of mandible appendages. The body colour is at first white, but the more heavily chitinized portions darken at an early stage, long before transformation to the adult is complete. Pupal movements are possible owing to the flexibility of the abdominal segments.

INJURY BY AND ECONOMIC SIGNIFICANCE OF THE INSECT.

The pinhole borer, *Crossotarsus grevilleæ* Lea, is a common rain-forest species, and during the summer months the free-living adult population is relatively high. Consequently few logs reach the mill without at least some burrows initiated by the insect. Unlike the majority of allied species, the burrow system is carried right through the heart wood, and the whole of the wood tissue may ultimately be riddled by the insect. While the injury may be of no great importance for many structural purposes, it is quite otherwise in timbers used for fine work in which a flawless finish is essential. Curiously enough, the majority of the timbers attacked are particularly suited to fine work in which veneer is worked on to a plywood base. Veneer cut from pinhole borer-riddled logs has invariably to be discarded. In the preparation of veneer, the logs are usually flitched—*i.e.*, cut into sections before treatment by the veneer knife—but borer defects may not be apparent on the rough surface left by the circular saw; hence it is not uncommon for a flitch to reach the knife before its defects are noticed. The expense of special handling for veneer purposes has then to be added to the loss already involved when logs purchased as veneer quality are cut for structural purposes.

A considerable volume of timber suitable for veneer is exported in the log to overseas destinations. If the timber cuts to specifications, the expense entailed in freight and handling charges is comparatively small. On the other hand, should the logs be infested with *C. grevilleæ*, the net loss is greater than if the logs had been milled in this country. Faulty logs are thus of greater significance to the overseas than the domestic market, and importers now insist on a rigid inspection before shipment as a reasonable guarantee that only sound timber will be forwarded.

In most mills handling North Queensland cabinet woods, the yards are at times strewn with logs rejected for veneer purposes. These will ultimately be cut up and sold in less profitable ways. A number



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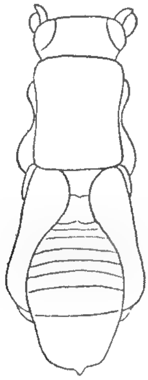

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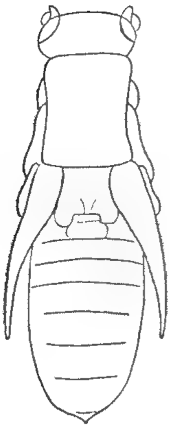

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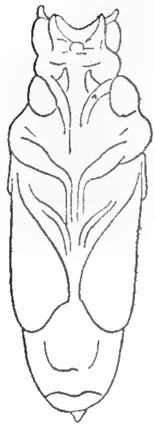

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I.W.Helmsing (after Smith)
1935.

PLATE 168.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Fig. 1.—Male pupa, ventral view.
Fig. 2.—Male pupa, dorsal view.
Fig. 3.—Female pupa, dorsal view.
Fig. 4.—Female pupa, ventral view.

of causes may have prompted their rejection, but pinhole infestation is a common trouble and the loss from this source is much greater than is generally supposed, particularly when the interval between felling and milling is extensive.

HOST PLANT RANGE.

The range of host plants of *C. grevilleæ* is a particularly wide one, for no commercial rain-forest species in North Queensland has been found to escape attack if placed under conditions suitable for mass infestation. The greater part of these are, of course, Angiosperms, but at least two of the millable Gymnosperms—kauri pine and brown pine—are susceptible to attack. Though timbers vary in hardness, the relative infestation of both soft and hard woods is very similar, largely because the bulk of the insects initiate burrows in the sapwood and work from thence into the heart wood. Though burrows are initiated and eggs laid by the female, the immature forms may not reach the pupal stage and the life cycle remains incomplete. Pupal chambers are the only satisfactory proof that reproduction has reached its end point in the production of adult progeny. Judged by this criterion, it must be concluded that burrow initiation, though invariably followed by egg deposition, commonly fails in its main purpose—*i.e.*, the propagation of the species. In spite of this, the prodigal distribution of suitable breeding material under conditions favourable to mass infestation is such that the Crossotarsan population is maintained at a comparatively high level.

The following Angiosperms are host plants of this pinhole borer:—Black bean (*Castanospermum australe*), canary ash (*Beilschmiedia Bancroftii*), canary sassafras (*Daphnandra micrantha*), maple silkwood (*Flindersia Brayleyana*), northern silky oak (*Cardwellia sublimis*), nutmeg (*Meristica indica*), penda (*Xanthostemon pubescens*), red cedar (*Cedrela australis*), red tulip oak (*Tarrietia perilata*), rose butternut (*Blepharocarya involucigera*), satin sycamore (*Ceratopetalum Virchowii*), scrub turpentine (*Canarium Muelleri*), silver ash (*Flindersia Bourjotiana*), spur mahogany (*Dysoxylon Pettigrewianum*), silver basswood (*Panax Murrayi*), walnut bean (*Endiandra Palmerstonii*), water gum (*Eugenia gustavioides*), white cheesewood (*Alstonia scholaris*), white quandong (*Elæocarpus grandis*), white silkwood (*Flindersia acuminata*).

The only Gymnosperms so far recorded as host plants are:—Kauri pine (*Agathis Palmerstonii*), brown pine (*Podocarpus amara*).

[TO BE CONTINUED.]

An Introduction to Beekeeping.

By HENRY HACKER, F.R.E.S., Entomologist.

[*Continued from p.* 367, *April Issue.*]

SECTION V.—GENERAL MANAGEMENT OF BEES.

Stings.

THERE would probably be many more people keeping bees than at present, were it not for the natural fear of stings, but as their habits become better understood this fear disappears almost entirely. A bee-sting is constructed with minute barbs on its spear-like tip, which prevent the bee from withdrawing its sting rapidly, with the result that the poison bag is torn out and left attached to the sting. The mutilated bee flies away but always dies after a few hours. The sting with the attached poison bag should be withdrawn by a scratch with the finger nail, and a puff of smoke on the place will disguise the smell of the sting poison which irritates the bees. The first sting, which is a warning of others to follow, should be carefully avoided. Quick movements tend to irritate bees, and novices on approaching a hive should avoid striking at the insects which happen to fly towards them, or making other quick movements of the head or hand to avoid the dreaded sting. This rapid movement alone will attract other bees, and stings are very likely to follow.

Handling Bees.

When working with a hive of bees, the beekeeper should stand at one side and not in front of the entrance, for in the latter position the flight of the bees is interrupted. Before opening the hive, blow a little smoke into the entrance and then wait quietly for a minute. This smoke disarms the entrance guards, drives them in, and occasions a sound of alarm throughout the hive, which causes the bees to fill their stomachs with honey. In this condition they are much more agreeable and, therefore, easier to handle. Next quietly lever up the cover and puff a little smoke under it to drive the bees down between the frames. The cover now being lifted, the frame nearest the operator may be loosened and taken out at will, the others being crowded together to give more room for its removal. Do not jar the frame or drop it, but lean it on end against the back of the hive out of the way, to avoid kicking it, and at the same time to prevent crawling bees from getting up one's trouser legs. The frame on which the queen is found should not be placed down outside, because of the danger of losing her. The frames should be replaced in the hive in exactly the same position from which they were taken, in order to minimise the amount of disturbance.

The best time to handle bees is during the middle of a warm sunny day when flowers are about. Never handle them at night or on cold, wet days unless in absolutely necessary preparation for moving or other operations. Bees should, indeed, not be handled unnecessarily at any time, for such disturbances always interfere with their normal activities. The use of too much smoke troubles them so greatly that they will cease work for several hours.

Clipping Queen's Wings.

Clipping the wings of each queen after she has commenced laying has several advantages. By keeping a note-book, as previously mentioned, a record of this operation may be entered and her age will be known. It is a great advantage at swarming time, as the queen is unable to accompany the swarm which will always return, and if suitable preparations have been made for its reception, it may be successfully hived.

Clipping is best effected with a pair of fine-pointed scissors. The queen should be gently lifted from the comb by grasping her wings with the finger and thumb of the right hand, which leaves her head and thorax free to be held with the finger and thumb of the left hand. The wings are then released, thus freeing the right hand for clipping the wings. Avoid handling or squeezing her abdomen, as it contains the ovaries which are sensitive to the slightest injury. Before attempting to clip a queen some practice could be obtained on a few drones until confidence is gained. The stumps of the wings should be about one-eighth of an inch long after cutting, which should be done on one side only. It is better to make the cut in a diagonal direction, leaving the thickened nervure on the front of the wing a little longer, to avoid bleeding, which may temporarily weaken the queen.

Tiering.

When the bees begin to swell the brood-combs near the top bar of the frames with new comb, or when a honey flow is just beginning it is time to put on an extracting super. This is a hive body exactly similar to a brood chamber, and is provided with drawn-out combs, or failing these, with frames containing full sheets of foundation. Most beekeepers put only nine frames in a ten-frame hive body when used as a super, because the extra space between the combs allows the bees to make thicker and more even combs, which are much easier to uncap.

If the colony is strong enough the bees will immediately take possession of the super, but should they be disinclined to go up, a frame of brood may be taken from the brood chamber and placed above, exchanging it for an empty comb, and this will usually induce the bees to commence storing honey in the super.

Many beekeepers work with a single super, but it is not the best method, as during a good flow honey is sometimes lost for lack of storage room, while if the unripe honey is removed in order to make room, trouble will occur later on through this watery honey becoming sour and fermenting.

In order to ensure that only thoroughly ripe honey is extracted, and at the same time to take full advantage of a sudden honey flow, several spare supers containing drawn-out combs are necessary. These are tiered up one above the other as they are required. When adding an additional super to the tier it should always be placed next to the brood chamber, and the others containing partly-filled or unsealed comb placed above these two.

The thorough ripening of honey cannot be too strongly recommended, and tiering should be practised, especially in the moist coastal districts, as the honey is improved both in density and aroma the longer it is kept in contact with the bees.

Strong Colonies.

One of the chief aims in manipulating bees is to build up strong colonies and endeavour to have them at their maximum strength at the time of the chief honey or nectar-flow. Observation of the local flora with a careful note of the buds showing on the various eucalypts or other trees, together with a record of the rainfalls and climatic conditions generally, are good guides in this respect. If the chief flow occurs early in the season, preparations should have been made during the previous autumn to see that each colony possessed a young queen, and that they had sufficient stores.

If two full-depth bodies packed with bees can be built up just before a nectar-flow, the bees will fill two or even three honey supers, as a young well-bred queen will easily keep two bodies filled with brood during an average season. As the consumption of stores by weaker colonies is just as great as by strong ones, and as they give less surplus honey, it is evident that a moderate number of strong colonies is a better business proposition than a larger number of weaker ones, besides requiring less work.

Feeding Bees.

It is occasionally necessary to feed bees to keep them alive sometimes after a severe winter if they have run out of stores before the spring flowers arrive, and sometimes during a drought. At other times it is advisable to feed them, perhaps not to keep them alive, but in order to procure a maximum honey crop.

Feeding is not done to make honey from the syrup fed, but to induce brood-rearing in a season of dearth, so that a vigorous colony will be available when nectar becomes abundant; otherwise brood-rearing will be so greatly reduced that the colonies will lack strength to gather a profitable crop of honey. It is often possible and cheaper, however, to move the bees into a good temporary locality to avoid feeding. After eggs are laid, six weeks must pass before the bees are old enough to gather nectar, and if a colony is short of food, few eggs will be laid. When a nectar flow begins, egg laying will suddenly increase, but the bees reared from these eggs will ordinarily not be old enough to gather much nectar before the flow stops.

When honey is not available, stimulative feeding should be done with a thin sugar syrup of a consistency similar to that of fresh nectar. The best possible artificial bee feed is made from pure white sugar dissolved in water. Two parts by volume of sugar to one of water make a satisfactory thin syrup for stimulation.

There are several types of feeders, probably the most suitable for all purposes being the Alexander feeder (Plate 144, fig. 5). To use it the hive is moved back about 2½ inches on the bottom board, and the feeder, which is the full width of the hive, is placed outside and underneath the hive at the rear. The bees consume the sugar from inside the hive, and if the feeder is fitted close to the hive the bees are protected from the attacks of robber bees. Another pattern called the simplicity feeder is used in an empty super over the brood chamber. A third type is the division board feeder which hangs in the hive like a frame, while the Boardman feeder is placed in front of the entrance to the hive.

Wintering Bees.

Owing to the genial winter climate of Queensland the beekeeper may dispense with elaborate precautions such as winter packing, chaff hives, or underground cellars, required in colder countries. Here the bees can remain on their summer stands although the spare supers should be removed, and the hive entrances contracted to about half that of the summer width. At least 30 lb. of honey should be left in each hive, and many beekeepers leave a super filled with sealed honey above the brood. This ensures an ample supply of winter stores, and any that is not consumed may be extracted in the spring when the new honey begins to come in. In a district liable to frosts a few thicknesses of newspaper folded over the top of the frames and down the outside of the combs will keep the bees snug and warm and reduce the amount of stores that would otherwise be consumed in maintaining the temperature of the colony.

Spring Cleaning.

As soon as the spring really sets in no time should be lost in going through all the hives and getting the colonies into good shape for the coming honey flow. A good practice among some experienced beekeepers, and one which may be recommended, is to commence with a clean spare hive and then transfer to it all the frames from the first hive actually in use. The hive thus emptied is then thoroughly cleaned, all the burr-comb, propolis, wax-moth cocoons, and other debris removed, after which it is ready to accommodate the frames and bees from the second colony. This change into a fresh hive is continued through the entire apiary, taking care that the original stands occupied by the colonies are not altered. The operation has a stimulative effect on the bees, to which they respond by exhibiting greater energy in carrying on their various activities. When the colonies are being overhauled any hives that are leaning should be levelled up, as this will result in straighter combs being built. The queens should also be looked for, as they are more easily found at this time than later on when the hives are more populous. Note their age, and if too old, enter the hive numbers in the note book as being among those which require requeening. A beginner will be able to distinguish an aged queen by the corrugated appearance of the outline of her abdomen, whilst in a young queen the outline of the abdominal segments presents an almost straight line.

This is the best time for clipping the queen's wings. Faulty combs, or those with a large proportion of drone cells, may be replaced with other combs or full sheets of foundation. The quantity of winter stores remaining in the hives should be noted, and where the supply is nearly exhausted feeding should be commenced, as it is essential that at this time the hives should have ample stores so that no obstacle exists to brood-rearing.

Uniting Colonies of Bees.

Sometimes the best plan is to unite weak, hungry colonies with stronger ones. Perhaps the beekeeper has on hand several weak swarms that issued late in the season, or colonies that have gone back through queenlessness or other causes. Much may be gained and nothing lost by uniting these weak colonies. The bees' knowledge of the exact position of their hives makes it necessary that colonies to be united during the active season should stand within a few feet of one another,

otherwise bees will become lost. If it is desired to unite colonies situated further apart, they may be gradually moved towards each other at the rate of 2 feet each day until they stand side by side. Each colony has its own odour which the bees recognise, so that it is necessary to guard against fighting and, perhaps, robbing. To avoid this, uniting is best performed late in the day. Both colonies are well smoked, and the combs are arranged in the new hive with a view to mixing the bees as much as possible. The brood-combs from each colony should be placed alternatively, commencing in the centre of the hive and working outwards, and the heavier combs of honey placed at the sides to fill the hive, the light or faulty ones being left out, and from these the bees may be shaken on to a large board leaning against the entrance. The bees usually take good care of the queen, but as a precaution she may be caged in the hive for forty-eight hours. If both colonies have queens it is advisable to keep the poorer one caged in the hive until it is ascertained whether the other has been accepted or not.

A more modern and simple method of uniting is as follows:—The queen of the weak colony is destroyed and the cover is removed and a double thickness of newspaper put in its place. The bottom is taken from under the other colony, which is then set on top of the newspaper cover. Thus two colonies are housed on the same stand separated only by the newspaper. The bees on both sides of the paper will immediately begin to gnaw it away, and by the time they have cut through and carried it out of the entrance, which generally occupies twenty-four to forty-eight hours, they will have acquired the same odour, and will not fight.

They need not be assisted in removing the barrier, but during hot weather it may be necessary to provide for ventilation of the colony above the newspaper. This may easily be done by pushing wooden matches in between the paper and the edge of the upper hive body, thus leaving a narrow air crack too small for bees to pass through.

Robber Bees.

Where the flow of nectar is constant throughout the working season the beekeeper will experience little or no trouble with robber bees, but should the trees which have been yielding nectar suddenly cease to do so, the bees will require careful handling. The last extracting for the season is usually marked by more or less robbing, especially if any honey has been dropped or left exposed. As bees in a natural state never see honey outside a hive, they immediately become excited and commence to fight and rob each other's hives until sometimes the whole apiary is in an uproar. The weaker colonies are the greatest sufferers, sometimes being completely robbed of their stored honey by the stronger colonies.

The avoidance of this source of loss, which is often caused by carelessness on the part of the beekeeper, lies firstly in never leaving honey, pieces of comb, or, in fact, anything that bees will rob, exposed about the apiary, and secondly, in never attempting to extract or even open the hives when the conditions are such that the bees exhibit a tendency to rob.

Swarming.

Bees swarm when the hive is full of brood and adult bees and the incoming nectar is abundant. At such times they are apt to hang out on the front of the hive for several days before swarming. The swarming

season in Queensland is long, extending from September until March, but most swarming takes place during the months of October and November. When the swarm, consisting of practically all adults in a hive, comes forth, a great deal of confusion apparently occurs. The bees fly rapidly about in an unorganised fashion, but after a few minutes, if the queen is accompanying them, the swarm becomes quieter and flies with a definite system. Before long a great mass of bees will settle of its own accord on some convenient place for further organisation. They will move again after an indefinite time, ranging from a few minutes to several hours, and will now go, perhaps to a great distance, to a hive, a house, a tree, or other suitable shelter previously located by the scouts.

Capturing Swarms.

Two methods of capturing and hiving swarms are given here; the first method is suitable for ordinary swarms where the queen bee accompanies the other bees, while the second method is the most suitable where clipping the queen's wings is practised.

When the swarm has clustered for the first time the swarming box is brought into use. This box is simply made and is a great convenience. A 3-inch ventilation hole is bored through each of two opposite sides and covered on the inside with wire gauze, and a tin slide is fitted on the outside to cover the hole and darken the box. Hold the box close under the cluster of bees, with the sliding lid pulled wide open, then jar or cut off the cluster from the object on which it is supported so that it falls into the box. Close the lid except for a space of about an inch, and stand the box down on end, with the opening at the bottom so that the remaining bees may enter. The lid is then tightly shut and the box of bees is placed in a cool place until the evening, when the bees may be transferred to their permanent quarters.

The hive is made ready to receive the swarm by placing one frame of unsealed brood in the centre and filling the hive body with frames of foundation.

When transferring the bees from the box to their new home prop up the body about an inch from the floor board, and lay a piece of bagging in front on a level with the entrance. Then give the swarm box one or two sharp jerks, open the lid, and pour the bees out on the bagging.

The surplus brood-combs from the colony which has given off the swarm may now be disposed of, for it is generally considered unprofitable, in the case of apiaries carrying their full complement of hives, to attempt to once more build up the parent colony except in the case of very early swarms. The combs will have a number of queen cells attached, and if the bees are of a good Italian strain it is desirable to save them. The combs containing these queen cells are simply placed on top of the parent colony, over a queen excluder, until the cells are ripe. These ripe or sealed queen-cells may then be detached and used in the apiary. If there are any weak colonies in the apiary, the body of brood-combs, after the removal of the queen-cells, should be given to one of them as a super, and it will strengthen it wonderfully.

As previously mentioned, it is a good plan to clip the queen's wings in order to prevent the possibility of the swarm flying away; this should be done during an examination of the colonies in the early spring before

the bees become numerous enough to make it difficult to find the queen. When clipping is practised the grass around and for some distance in front of the hives should be kept short during the swarming season, and someone should be present in the apiary to attend to the swarm when it emerges, and to pick up and cage the queen before the ants find her. She will probably be seen in the grass in front of the hive entrance, and when caged should be placed in a shaded and safe place—the pocket for convenience. The apiarist should get quickly to work and select a frame of brood containing some eggs and larvæ. This is then put in the prepared hive, in the centre of frames containing full sheets of comb foundation. If desired, this brood can be taken from the parent colony, providing there are no queen-cells on the comb. Next remove the parent colony and place the newly prepared hive on the stand that was occupid by the parent colony, with the caged queen at the entrance. The flying swarm will soon discover that their queen is not among them, and will return to what is now the prepared hive. The queen can be liberated when the bees settle down, which will be about one hour later. The surplus brood-combs from the parent colony may be disposed of as previously mentioned.

Swarm Control.

Swarming is a natural instinct brought on by the surrounding conditions, which may be controlled to some extent by the beekeeper. The following manipulations tend to reduce swarming:—(1) The introduction of young queens, preferably the progeny of queens whose colonies are not disposed to swarm. (2) The prevention of crowding in the brood-chamber previous to the honey-flow by the use of good worker-combs, to reduce the number of cells unavailable for worker eggs, also by the removal of combs of brood, which are replaced by empty combs or sheets of foundation to relieve the congestion. (3) The removal of queen cells soon after they are started, since, if queen-cells are well advanced, their removal is not so effective in preventing swarming. This usually requires an examination of the brood-chamber once in seven to ten days. (4) Excessive heat within the colony, another potent factor in swarming, may be reduced by using a shade board and increasing the opening for better ventilation.

Requeening.

The queen, being the mother of the colony, is by far the most important bee in the hive. Should she die, leaving no young worker larvæ from which another queen can be raised, the colony will dwindle away unless another queen be given to it. A queen may prove unsatisfactory and require replacing for several reasons. She may be a worthless drone breeder, or she may be unprolific. Furthermore, the prolificness of a queen usually diminishes rapidly after her second year, and she then fails to maintain the large population necessary for harvesting a maximum honey yield. Another common reason for requeening is a desired change in the race of the colony from black or hybrid bees to Italians. If the Italian queen has been mated with a pure Italian drone all the bees in the colony will be pure Italians as long as the queen remains alive.

Before requeening, the first thing to do is to catch and kill the old queen, otherwise the fresh one will undoubtedly be killed. The usual practise is to lift out the combs one by one and examine them until

the queen is found. It is handy to have a spare body near the hive so that the frames, as they are examined, may be placed therein; otherwise while one comb is being examined the queen may pass from an unexamined comb to one that has been examined and replaced, and she will be missed. If all combs have been examined and the queen not found, carefully examine the floor board and sides of the hive, then re-examine the combs as they are replaced.

The old queen having been disposed of, the usual method is to leave the hive queenless for a day. The following day the queen is introduced to the hive from the mailing cage (Plate 144, fig. 3) in which she was received through the post or in a similarly shaped wire gauze cage called an introducing cage (Plate 144, fig. 1). The cork or corks in the cage and one frame from the hive are removed and the mailing cage is then wedged in the centre between the remaining frames. In the course of a few days the bees in the cage and those outside eat away the candy and the queen is released. By this time she will have the scent of the hive, and will be accepted.

Another method which has been recommended by those who have used it with complete success is the paper bag method. Take a small, thin paper bag, such as is used for lollies, place the queen to be introduced therein, without any of her attendant bees, then catch half-a-dozen bees from the hive and place them in the bag with her. These bees should, if possible, be young, and filling themselves with honey from the cells when caught. Although the queen is strange to them, they will be so busy trying to get out that they will not take any notice of her, and in the meantime they will all acquire the same scent. Remove one frame and place the bag in the hive between the frames, and in the course of a few hours the queen will have been released and accepted. The advantage of this method is that there is no need to leave the hive queenless for a day. One may open the hive, destroy the old queen, and introduce a new one in a paper bag straight away with considerable success. Whichever method is adopted, the hive should not be disturbed for about three days, after which time it should be opened to see that the queen is all right.

Supersedure.

Bees generally supersede queens in their third year, or those which are failing during their second. The latter may still be fairly prolific, but by some means the bees know that they would not live through the coming winter, and that it is necessary to raise successors while drones are still flying. The queen cells which bees construct when superseding are few, rarely more than one or two. They are generally built on the face of one of the outer combs, often a brood comb, as in the case of swarm queen cells. Supersedure cells must not be mistaken for swarm cells and destroyed, or the hive may eventually become queenless.

Artificial Increase.

In remarks on swarming the well-established beekeeper was advised to break up the parent colony after the issue of a swarm. The reader may thus perhaps wonder how a beekeeper can increase his apiary should he desire to do so. A strong colony can, of course, be divided into three or four nuclei, but doing this probably destroys all chances of securing a crop of honey, and at the same time is almost sure to cause some brood to die.

The following plan, known as the Alexander method, avoids all loss of brood through chilling, and at the same time enables one to make a moderate increase as well as to secure a honey crop.

When a colony is nearly full enough to swarm naturally, and the beekeeper wishes to make two from it, he lifts it from its stand and puts in its place a hive containing frames of comb or foundation just as he would prepare a hive for a swarm. The centre comb is removed from this new hive, being replaced by a frame of brood from the old hive. It is important to see that no queen cells are present in the comb, the next step being the liberation of the queen from the old hive on this brood comb. Then a queen-excluding honey-board is placed on top of the new hive which now contains the queen, a frame of brood and empty combs. The full queenless old colony is then placed over the excluder, and, after filling the space left by the removal of the brood comb with the comb previously taken from the new hive, the upper hive should be closed except for the entrance the bees have through the excluder into the hive below. They may be left in this way for about five days, then the frames should be carefully looked over, and if any larvæ are found in queen cells, the two hives had better be separated at once. This premature separation will give two colonies, but a certain amount of brood will be chilled. If, however, the bees have not started any queen-cells above the hives may be left together for ten or eleven days, during which time the queen will have a good amount of brood started in the lower hive, and every egg and larva that was in the old hive on top will be capped over and saved. The two hives may then be separated, the old hive being placed on a new stand. It will then be full of young bees and capped brood, and in about twenty-four hours they will accept a ripe cell, a virgin queen, or a laying queen, as they will then realise that they are hopelessly queenless. If possible a laying queen should be given, as full colonies should not be without a laying queen a day longer than is necessary.

By this method two strong colonies may be obtained from one without losing any brood or checking the laying of the queen, and these colonies are not likely to swarm during the remainder of the season.

The few failures with this method have been due to dividing colonies that had already made some preparation for swarming by having eggs or larvæ in their queen-cells. In some cases the colonies have actually been divided when they had capped queen-cells in their hives at the time the queen was put in the new hive, and, of course, they swarmed in a day or two, which illustrates the need for observing the state of the colony to be manipulated.

Rearing of Queens.

At the end of the first section of this article it was pointed out that queens lay more eggs during the first year than in any other, after which the number of eggs laid gradually diminishes until the queen is replaced. Every beekeeper knows that, other things being equal, the greatest amount of surplus honey is produced by the numerically strongest colony. It follows, therefore, that in order to maintain a colony at its maximum strength the queen should be replaced by a younger one at least every two years.

Writers on this subject have made various estimates regarding the number of colonies a beekeeper should possess before he attempts queen rearing. One authority mentions fifty colonies, another one hundred

colonies, while a third recommends a commercial beekeeper not to attempt to rear his own queens, but to concentrate all his efforts on honey production. Very good untested queens can be purchased in this State for five shillings, but this charge, although small for one or two colonies, reaches a formidable total when multiplied by a few score.

It will, of course, be necessary for the average beekeeper to buy some queens in order to obtain good breeding stock. Furthermore the beginner can scarcely expect to rear good queens during the first year, and no one can hope to do so until he becomes well acquainted with the habits of bees.

The three impulses under which a colony will rear a queen under natural conditions are swarming, supersedure, and queenlessness, and in rearing queens by the so-called artificial methods it is necessary to follow rather closely one of these three. In practice the beekeeper can take queens from normally constructed queen-cells. By making the colony queenless a considerable number of these will be reared, and by very careful watching almost all of them may be captured and caged before they kill each other or destroy the other cells. To do this, however, it is necessary to look over the entire colony frequently each day for several days. This plan is not to be recommended except where it is impossible to use some of the better methods.

Saving Natural Queen-Cells.

During the swarming season the beekeeper can often obtain a number of fine queen-cells by taking queen-cells from colonies preparing to swarm, provided the parent queens are of satisfactory stock. By placing these in colonies to be requeened, after the removal of the condemned queens, requeening takes place naturally without further manipulation. Making a colony queenless early in a honey-flow costs less, perhaps, than a period of queenlessness at any other time, in that the eggs laid are not of value as future honey-gatherers. Furthermore, this may often be done in connection with dequeening to control swarming. By keeping a watch for opportunities to utilise good, natural queen-cells, time may be saved by reducing the amount of artificial queen-rearing.

Building Natural Queen-Cells.

For convenience the alley method of queen-rearing has much to commend it. A strip of comb is cut out just wide enough to contain one complete row of cells containing eggs. This is then cut down by removing about two-thirds of the walls on one side. With a match or small stick two in every three eggs are destroyed, leaving the cells empty. This strip of comb is now fastened to the lower edge of a 2 or 3-inch strip of empty comb attached to the upper part of a frame, the eggs remaining being pointed downwards. This prepared frame is now given to a queenless colony from which all young unsealed brood has been removed. The workers remodel the cells which contain the eggs, making them into queen-cells.

Queen-Cells on Artificial Bases.

To have the queen-cells in more convenient shape for handling, Doolittle artificial cell-cups are prepared by dipping a smooth stick with rounded end into melted wax and removing the adhering wax.

Another and more popular method is to use wooden cell-bases. A short cylinder of wood is hollowed out on one end and lined with wax, the cavity being the size of a queen-cell base. These wooden cell-bases are fastened to the underside of moveable wooden bars in the cell-raising frame.

Transferring Larvæ.

Having made the necessary cups or bases they are inverted, and the usual practice is to wipe the inside of the cell with a little royal jelly procured from another queen-cell. Young larvæ are now carefully lifted from the worker-cells and placed in the artificial cell-cups, being taken, of course, from the colony of the queen selected as best for breeding. The supplied cells are hung in a normal colony prepared for cell-building. The larvæ chosen should be as young as they can be obtained, preferably not more than one day from the egg. Older larvæ may be used but the resulting queens will probably be less valuable.

After cells have been accepted, *i.e.*, the worker bees have commenced to draw them out, they should be transferred to a second strong colony and placed in the upper story which is protected by perforated zinc to keep the queen from destroying the cells. If there is no honey flow it is necessary to give the colony some sugar syrup or honey daily to keep it in prime condition. The cells will be well cared for in strong, queenless colonies, but to keep colonies queenless for long is expensive. It is a well-recognised fact that if a colony is divided by perforated zinc the portion away from the queen is in a condition to build and care for queen-cells and may be considered as virtually queenless.

Nursery Cages.

Before the queens are ready to emerge, about ten days from the time of transferring the larvæ, each cell may be put in some sort of nursery cage (Plate 144, fig. 2) so that as the queens emerge they will not kill each other or destroy other cells. As a rule individual cages for each queen-cell are best. If colonies are ready to receive them, the best method is to put each queen-cell in a colony so that there will be no necessity for introducing adult queens. In case it is desired to have the queens mated before introducing them to full colonies, the queen-cells or virgin queens may be put in small colonies usually known as nuclei. These are miniature hives built to hold about three frames. The queens may safely be kept in them, one in each nucleus, during the active season or until it is convenient to introduce them to full colonies.

SECTION VI.—INSECT ENEMIES AND DISEASES OF THE HIVE BEE.

The insects responsible for causing the greatest damage to bees are the wax moths, but where the combs are properly stored and fumigated and strong colonies of bees are maintained these cease to be a menace. Ants are sometimes very troublesome, and the beekeeper is well advised to destroy every nest within 200 yards of his apiary, but the other insect pests to be mentioned are of minor importance. As a queen bee in the height of the season lays from 1,500 to 2,000 eggs a day it will be realised that the small toll of bees taken by predatory bugs and flies is almost negligible.

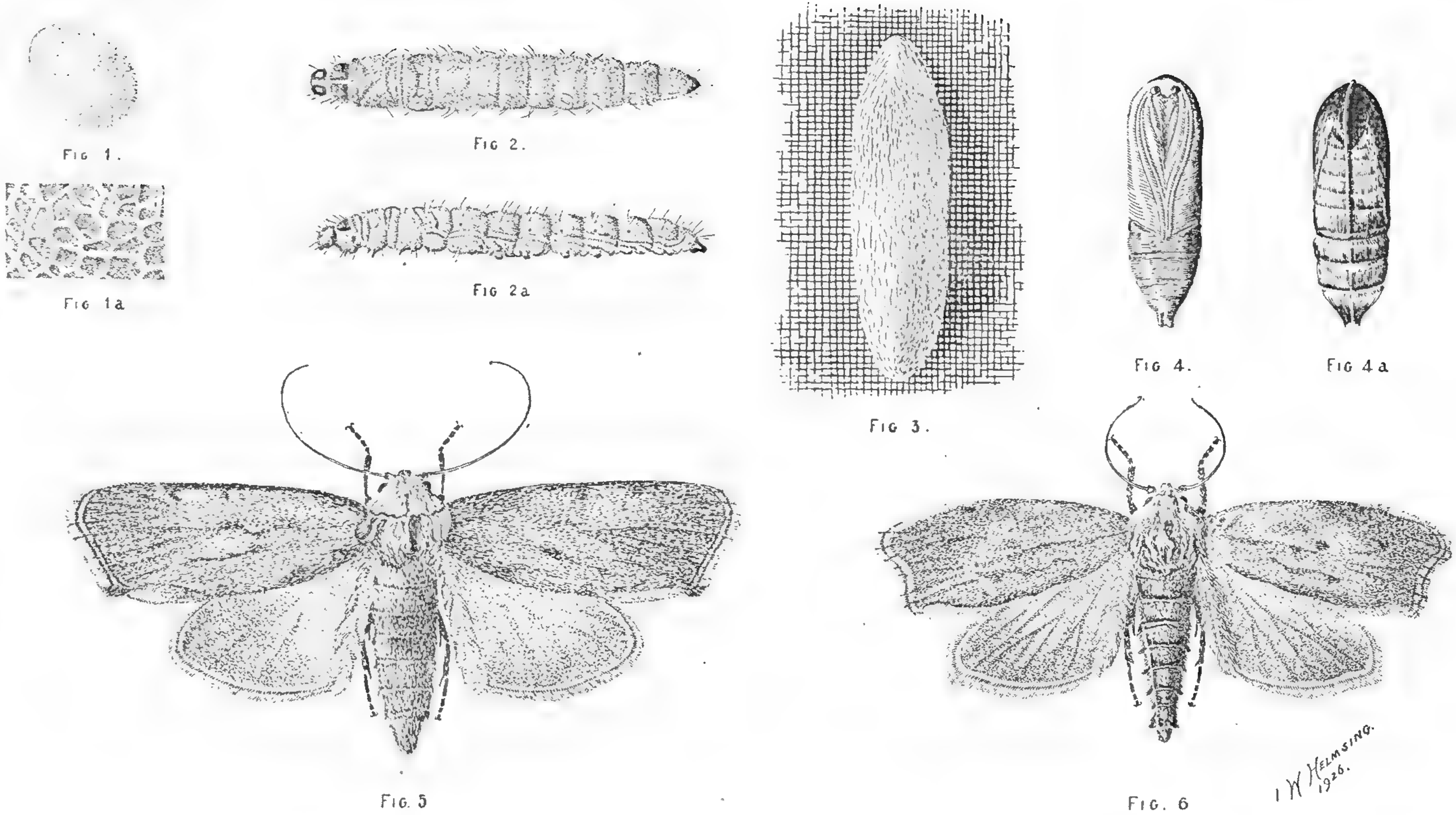


PLATE 169. LARGER WAX MOTH.

Fig. 1, Egg x 30.
Fig. 1a, Surface of egg x 210.
Fig. 2, Larva, dorsal view x 2.
Fig. 2a, Larva, lateral view x 2.
Fig. 3, Cocoon x 2.
Fig. 4, Pupa, ventral view x 2.
Fig. 4a, Pupa, dorsal view x 2.
Fig. 5, Adult female x $2\frac{1}{2}$.
Fig. 6, Adult male x $2\frac{1}{2}$.

Wax Moths.

Every beekeeper is familiar with the grey grubs which are responsible for the destruction of many of his combs. They are the larvæ of two different cosmopolitan species of moths, the larger wax moth, *Galleria mellonella* L. (Plate 169, figs. 5 and 6), and the lesser wax moth *Achroia grisella* Fab. Their habits are very similar, indeed, they may occur together in the same hive, but the former species is usually the more abundant and consequently the more destructive.

The popular name wax moths was doubtless given on the supposition that the food of the larva was chiefly wax, but attempts to rear them on chemically pure wax were unsuccessful. It was also noticed that they neglected nice, white super combs, and always attacked combs that had been used for brood-rearing which contained the larval skins left by developing bees or those containing brood or pollen. It is now known that these substances furnish the vitamins necessary for the full development of the moths.

The wax moths enter the hives at nightfall and deposit their eggs (Plate 169, fig. 1) about the combs into which the newly hatched larvæ tunnel. They line the sides of the tunnels with silk through which they can rapidly wriggle in order to escape from the bees. If the comb is held between the observer and the sun the movements of the larvæ within their tunnels are plainly visible. The typical appearance of an infested frame is shown in Plate 170.

When the larvæ (Plate 169, figs. 2 and 2A) are full grown they leave the comb and construct tough, white cocoons (Plate 169, fig. 3) of silk in which to undergo metamorphosis. These are generally attached to the top bar of the frames or to the sides of the hive. From the completion of the cocoons to the emergence of the adult moths occupies about a fortnight. The moths are then ready to fly about the hives, stored combs, or any wax refuse, seeking for places in which to oviposit and so produce another generation of grey grubs.

Wax moths invariably attack those colonies which are below normal strength, as the guard bees in a weakened colony are less alert in resisting the entrance of the female moths which are able to slip past, enter the hive, and scatter their eggs about the combs. In some instances the moths get in after the bees dwindle through queenlessness or excessive swarming. The remedy, therefore, is to maintain strong colonies, but unfortunately, in times of honey or pollen shortage this is not always possible. When some of his colonies become weakened the beekeeper should give them special attention and, if found to be infested, the combs should be gone through every few days, digging out moth larvæ with the point of a penknife and killing all moth grubs and pupæ enclosed in cocoons. By working along these lines the moth pest inside the hives would soon be under control. Additional precautions against infestation consist in cleaning up all scraps of comb found lying about, and keeping combs that are not in use by the bees safely stored in a place secure from attack by wax moths.

As one of the best assets that a beekeeper can possess is a good stock of surplus combs, great care should be taken to protect them from becoming infected with wax moth larvæ. This may be effected with little labour and at small cost by means of carbon bisulphide fumigation. To obtain the best results the supers for holding the combs should have all wax and propolis scraped from the top and bottom edges to

ensure a tight fit. The supers filled with the surplus empty combs should then be tiered up to ten high, and the crevices between the boxes pasted over with strips of paper so that the whole stack will be airtight, the top and bottom being made so by fastening a covering of board and newspapers securely to them to prevent the escape of the gas. The top covering is left open until the carbon bisulphide has been put on top of the uppermost set of combs. Some shallow holder is required for the carbon bisulphide, and the lever top of a 7-lb. honey tin will well answer the purpose. Such a tin-lid will hold quite enough of the liquid for a stack of ten supers, the quantity required for this number being about four tablespoonfuls. As soon as the carbon bisulphide has been inserted the top of the stack should be made airtight, and the stack is best left undisturbed until the combs are required.

When combs are to be put away until the following season carbon bisulphide should always be used although the combs may show no sign of moth grubs, as it is a cheap insurance of the safety of the combs. Care must be exercised in using carbon bisulphide which is both inflammable and explosive.

Ants.

Numerous species of ants disturb bees, and although they rarely attack them their presence irritates and excites the bees, resulting in the stinging of persons and animals near the hives. They may be conveniently divided into two classes, small and large, for the treatment recommended varies according to their size.

The small species consist of tiny black or red ants which overrun the combs and sometimes nest inside the hives. Where empty bags or pieces of hessian are used on top of the frames for mats these small ants take advantage of the warmth and shelter afforded and nest therein. Stands with various insulating devices have been recommended to protect the bees against such ants. While these may be useful to amateurs with only a few colonies, their adoption on a large scale where beekeeping is carried on commercially has been found impracticable.

The remedies likely to give satisfaction are:—Firstly, discard bag mats, for it is much better to have a bee space of ¼ inch between the top of the frames and the cover; secondly, mix 1 oz. of borax and ½ lb. sugar and boil for a few minutes in sufficient water to produce the consistency of thin honey, small quantities of this mixture being placed anywhere in the track of the ants, the mixture being covered in such a manner as to be accessible to the ants but not to the bees.

To the second class belong the meat ants, sugar ants, or other large species; these may readily be destroyed by means of carbon bisulphide. To destroy a meat ant's nest pour about an ounce of the liquid into each hole or crater in the mound and immediately cover it with bags. Then wait for three or four minutes, remove the bags, and apply a light attached to the end of a stick at least 5 feet long. The carbon bisulphide is highly inflammable, and no risks should be taken when applying the light to explode the fumigant.

Care must be taken not to explode the gas too soon. If the light be applied in less than the stated time it will be found that only a relatively quiet burning takes place, and there is no explosion causing the galleries to be shattered. The burning is, therefore, far less efficient than the exploding. The explosion is not completed for some minutes.

It is therefore advisable to wait about five minutes and then replace the bags over the nest. By again covering the nests the fumes are retained for a longer time, and many ants not killed outright during the explosion or before it will thus have less chance of recovering.

To obtain the best results it is advised that the work be carried out in the late afternoon, at which time there is the greatest number of ants present in the nests.

Other Insect Enemies.

Various other insect enemies have been reported by beekeepers from time to time. They are insects which have been found associated with the bees within their hives, and insects which are known to attack bees in the field. The former group includes such insects as cockroaches, plant bugs, beetles, and grasshoppers. Cockroaches are often found in even the strongest colonies, particularly on combs without bees; there does not appear to be any definite proof, however, that cockroaches injure the bees; indeed, one authority on beekeeping is of opinion that as the bees tolerate them in their hives they may be of use to the bee community. It has been observed that combs amongst which cockroaches are plentiful remained free from wax moth grubs, and it has been suggested that the cockroaches, which are omnivorous, eat the eggs of the moths.

The other insects mentioned have all been observed within the hives during the colder months, and as they were probably sheltering there temporarily, their presence may be disregarded.

The attacks made upon bees by insects in the field are of a more serious nature. Several species of predatory bugs have acquired the habit of hiding among flowers and seizing hive bees while they are engaged in gathering nectar. They have also been observed sitting on the tassels of maize cobs, catching and sucking the blood out of the bees as they come for the pollen. They are rather large and slow-moving bugs easily distinguished by the curved beak, which stands well away from the head basally, and by the very narrow head, always longer than broad. It is rather unnecessary to add that a beekeeper should destroy these bugs at every opportunity.

Dragonflies have occasionally been observed flying about apiaries and snapping up bees upon the wing. The natural food of even the largest species of dragonflies, however, consists mainly of mosquitoes, midges and other small flies. As complaints of this nature are not frequent, it is quite probable that the dragonflies invade apiaries only during periods when their natural food is scarce. When noticed hawking bees about an apiary, they may be captured with a butterfly net attached to a stick.

Large, active, robber flies capture other insects on the wing by spearing them with their hard beaklike proboscis. These flies do not discriminate in their prey, but will seize any other insect which they are strong enough to overcome. A proportion of their victims consists of hive bees, but remedial measures in this case are not practicable.

Termites.

In many localities termites, or white ants, cause much damage to hives. They do not attack bees, but quickly riddle the hive bottoms in direct contact with the earth. Colonies of termites have been observed

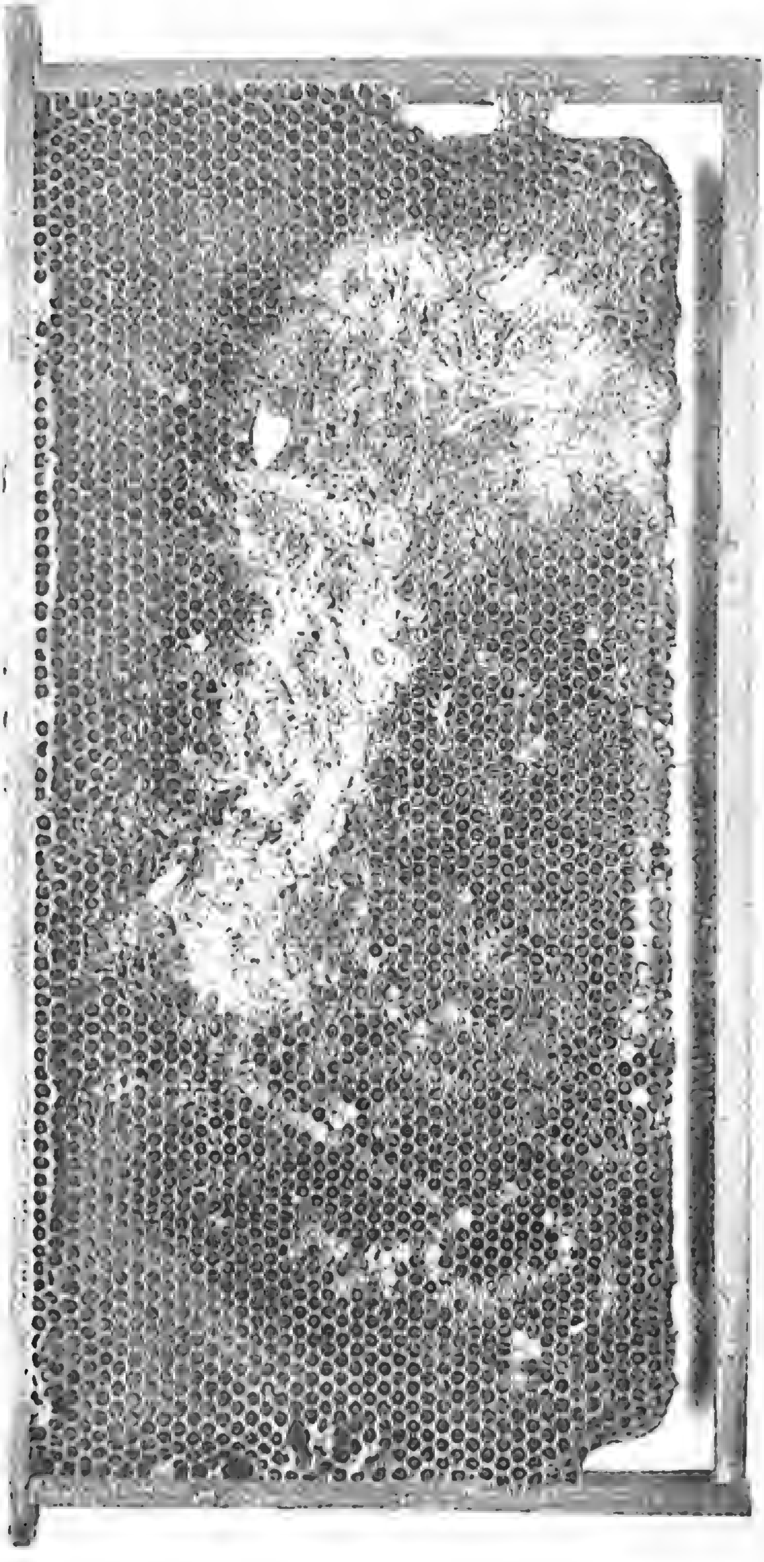


PLATE 170.

Frame of brood-comb showing damage caused by larvæ of the larger wax moth.

to eat up the bottom of a hive almost completely in one season. The remedies usually recommended consist in painting the underside of the bottom board of the hives with a chemical preservative such as coal-tar creosote, or with white arsenic at a strength of 2 lb. of the white arsenic to 10 gallons of water. The arsenic is not easily dissolved in water unless the solution is boiled vigorously, because the white powder floats to the surface and is difficult to wet. Experience over a large number of years has shown that white arsenic is a very effective poison against termites.

A local beekeeper has successfully overcome the termite trouble with cement bottom boards of his own construction. They are made in a mould and reinforced with cyclone wire-netting, as ordinary wire-netting is not quite strong enough. They are proof against weather conditions, as well as termite attacks. This beekeeper states that the bees winter in these hives quite as well as they do in the all-wooden article.

Foulbrood.

American foulbrood (Plate 171) is a disease of the brood of bees, which causes serious losses to beekeepers in many countries throughout the world. It is caused by a species of spore-bearing bacterium known as *Bacillus larvæ.* The brood becomes infected with the spores, which are invariably introduced into the hives in infected honey. The bees themselves spread the disease through the hive in their attempts to remove the diseased brood. When the disease has spread generally throughout the brood chamber, the bees cease trying to remove the dead brood, and the colony dies owing to the absence of emerging bees.

The disease may be recognised by the sunken and perforated cappings and the isolated sealed cells in the midst of recently emerged brood. The dead larvæ have a melted-down appearance and are usually extended lengthwise in the cells. Dead larvæ are slightly yellowish in colour at first, but become chocolate brown upon further decay. The decaying contents of the cell may, before they become too dry, be drawn out with a toothpick into fine silklike threads, which are quite ropy and gluelike. The dried-up brood, called scales, become tough and adhere so tightly to the floor of the cells that the bees cannot remove them. The bees usually make a small hole in the cappings when the disease is present and sometimes remove the cappings altogether, thus making it appear that the larvæ or pupæ died before being sealed. The odour is heavy and fœtid, rather resembling that of stale glue, this gluey odour being a marked symptom. Isolated sunken cells or perforated cells in the midst of healthy brood should be examined whenever disease is suspected. If in doubt, a piece of comb containing the suspected brood should be packed in a tin or small box and forwarded to the Department of Agriculture and Stock, Brisbane, for examination.

As previously mentioned, the only way the disease can be carried into a clean hive is with infected honey; it follows therefore that the chief precaution is not to allow the bees to obtain access to honey from an unknown source, and never to feed honey to bees unless it is known to be free from disease spores.

When queens are imported, it is a good precaution to destroy the accompanying workers, cage, and candy. If the cage method of introducing is adopted, the queen may easily be transferred to another cage that is known to be clean, before placing her in the hive.

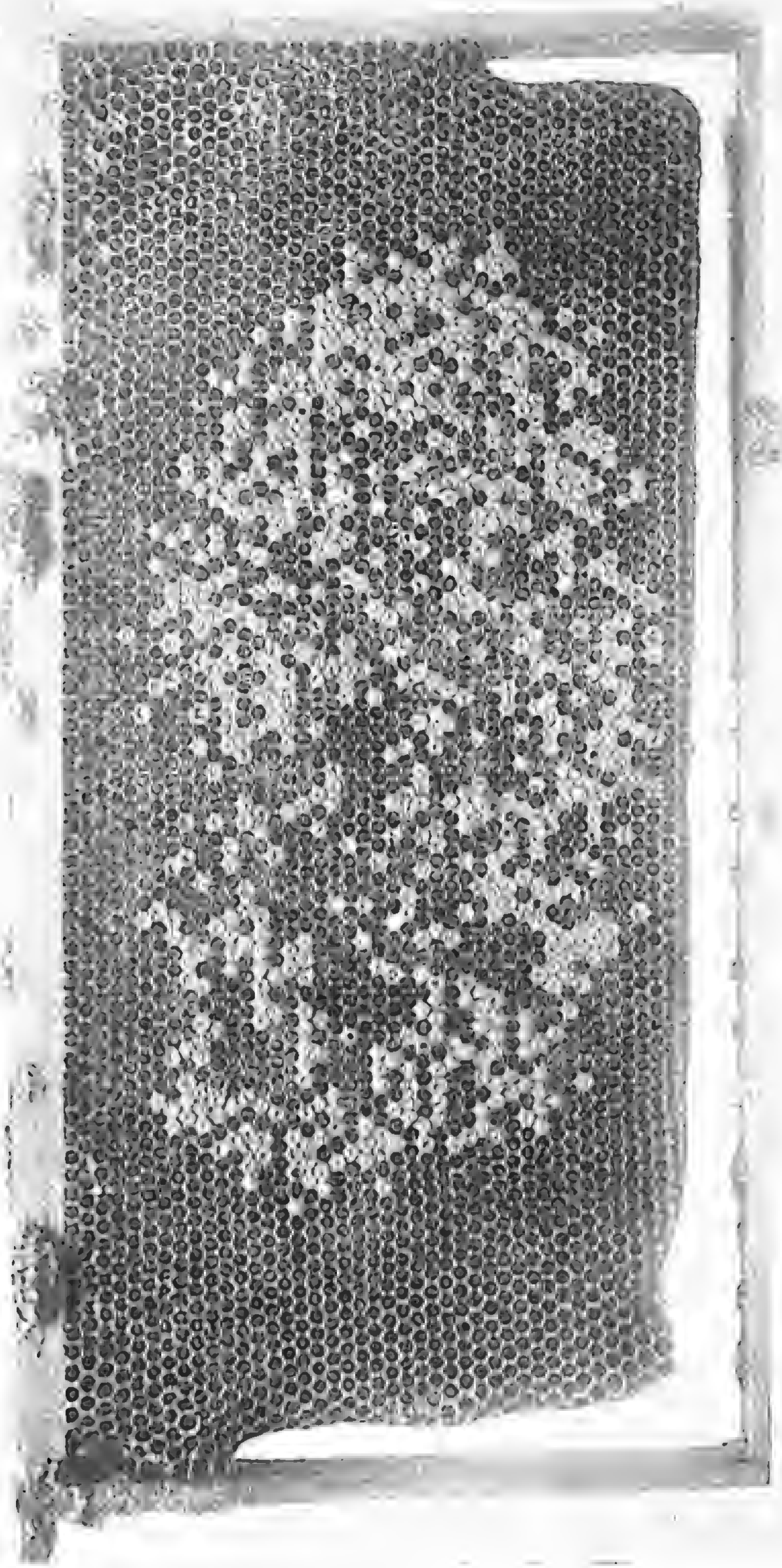


PLATE 171.
Frame of brood-comb showing infection by American foulbrood.

In the United States much time and money has been expended during recent years in trying to find remedies for foulbrood. At one period disinfecting solutions were recommended, and later the shaking method was considered to be a cure. According to a recent publication, both these measures are ineffective. The shaking treatment is not now recommended because the disease is rarely eradicated by that method, and a treated colony on disinfected combs cannot be pronounced clean for two years. After a number of years trial of the shaking method, it is admitted that the disease situation in the United States has not materially improved.

It is now commonly recognised that the safest and, in the end, the most economical means of stamping out American foulbrood is to burn the diseased colonies. While this procedure may seem wasteful to those who believe that less drastic measures afford protection, it is the only method that leaves no opportunity for the disease to recur.

Before burning, the bees should be killed by closing the entrance in the evening and sprinkling a pint of petrol over the top frames, after which the hive is closed tightly.

A pit 18 inches or more in depth should be dug and a good fire should then be kindled in order to thoroughly burn the brood and honey. The hives containing the dead bees should be carried intact close to the pit and the bees and frames fed to the fire. After they are consumed the top-soil surrounding the fire should be raked into the pit to prevent bees from healthy colonies from having access to any dead bees or honey; the pit should then be filled.

After the burning, the hive bodies, bottom boards, and covers should be taken into the honey house, thoroughly scraped to remove all propolis and wax, and then scrubbed both inside and out with a hot soap or lye solution and a stiff brush. The scrapings should be burned and the wash water disposed of in such a manner that it is not accessible to the bees. Washing with soap and water is also the best way to remove spores from the hands, clothing, tools, and extracting equipment.

Chilled Brood.

Chilled brood is brood which has been killed by cold, and may be produced by any cause which results in the temperature of any portion of the brood chamber being too low. It may be the result of injudicious brood-spreading, insufficient nurse bees, or faulty hives which expose the frames of brood to cold winds.

Although it is not really a disease, chilled brood is sometimes mistaken for foulbrood, but it differs from the latter in the following respects:—The odours peculiar to foulbrood are absent. Furthermore, if the capping of cells containing chilled brood is removed, the dead bees will be found in natural positions, slightly shrunken, black at the head in early stages, and finally becoming black all over. The larvæ turn greyish at first and afterwards become almost black. When the weather conditions improve the bees will rapidly remove the chilled brood from the cells which have been uncapped, whereas they will not under similar circumstances remove brood affected by foulbrood.

Pickled Brood.

A condition known as pickled brood may be distinguished from foulbrood by the following characteristics:—If the larvæ of pickled brood are pulled out of the cell with a pin or match, they have the appearance of liquid matter, and if the brood in capped cells are similarly withdrawn the abdomen will be found to contain liquid matter, and the head will probably be dark brown in colour instead of the almost black colour in the case of chilled brood; there is further a total absence of the stickiness and peculiar gluey odour which is characteristic of American foulbrood. Pickled brood is generally considered to be the result of overheating.

Sacbrood.

This disease has been considered by some authorities to be the same as pickled brood and both sealed and unsealed larvæ may be affected. Larvæ killed by sacbrood will usually be found stretched out along the lower wall of the cell and often with the anterior end turned up towards the upper wall. The colour changes from a pearly white and may vary from yellow to dark brown or grey. The skin of the larvæ becomes toughened so that the dead mass may be lifted out like a small sac, the contents of which are watery.

Sacbrood seldom causes any serious losses among bees. Colonies may become weakened, causing a reduction of the honey crop, but a colony is seldom killed outright by it. The disease usually appears during early summer, disappearing again with the commencement of a good honey flow.

Paralysis.

Beekeepers often designate practically all the diseases of adult bees which they observe as cases of paralysis. The first symptom noticed is that some bees are being dragged out of the hive by others. The former present an oily or greasy appearance and generally exhibit a trembling and jerky leg movement. Some writers have attributed this condition to hereditary weakness and recommend requeening as a cure. The disease is also said to be more prevalent in hot climates than in colder ones, and in this State it usually occurs during the summer months. Unfortunately similar symptoms are stated to develop in cases of poisoning caused by the use of chemical sprays on fruit and vegetable crops. It would appear, therefore, that these conditions are produced by more than one cause, and much more study will be necessary before it will be safe to give advice or recommend any particular treatment.

Spring Dwindling.

It also seems probable that more than one disease has been included under the term spring dwindling. To avoid confusion it should be applied only to the loss of bees in the spring, due to the fact that the adults have been weakened by poor wintering and die faster than they can be replaced by emerging brood. Poor quality honey for winter stores or lack of stores may be among the contributing causes.

Although it is rather alarming in early spring to see an accumulation of dead bees in front of the hive entrance, the writers experience is that the total loss of a colony is infrequent. Generally a mild change in the weather accompanied by some rain causes a small honey flow and

the trouble usually disappears. If a little stimulative feeding with sugar syrup has been previously given when the dead bees were first noticed, the colony will quickly build up to normal strength.

Acknowledgments.

Thanks are due to the Queensland Museum for the loan of the material for Plate 170 and to Messrs. Smith Bros., of Brisbane, who kindly loaned the apparatus illustrated in Plates 139 to 144. The photographs are the work of Mr. W. J. Sanderson, Departmental Photographer, and the illustration of the life history of the larger wax moth was prepared by the Branch Illustrator, Mr. I. W. Helmsing. The writer is also indebted to Mr. J. A. Weddell for co-operation in assembling the plates, and finally desires to thank Mr. Robert Veitch, Chief Entomologist, for advice and assistance in the preparation of this paper.

DEMOCRACY AND LAUGHTER.

Happiness is the true touchstone of Democracy. Where any considerable number of people find life "weary, stale, flat, and unprofitable," there is something wrong.

Are we really a happy nation? With every element of happiness within our grasp it would seem, sometimes, that we fail fully to realise the great desire. The eyes of the world are upon us, and if, as a nation, we fail to impress peoples elsewhere by that elation of spirit which speaks for joy and contentment, we are poorly meeting our responsibilities as children of Democracy.

We cannot make people happy any more than we can make them good by the multiplication of laws. Laws are conducive to happiness only as they promote justice, equality of opportunity, and comfortable conditions of life. An edict that, on a certain day, every man, woman, and child . . . must be happy would be ridiculous. It is worth remembering that the search for happiness begins and ends in our own hearts.

Many years ago, Matthew Arnold complained that we . . . lacked intellectual seriousness. To-day, there is greater reason to fear that we have lost our capacity for laughter. We are solemnly warned that mighty problems cry for attention, but these will be solved much more quickly if we approach them buoyantly. We may be as earnest as we please, but we must keep smiling. The darkest prospect is not so black as it appears. When I pass a crippled machine in the highway and the owner peers out from under his vehicle and greets me with a grin, I know that he is master of the situation, and will soon be on his way rejoicing.

Pleasant it is on starry nights to hear the laughter of children at play in the street or the jazzy twang where light-ankled youth trip gaily and know life to be good.

The loud laugh that speaks the vacant mind is one thing; honest mirth, testifying to courage, poise, and serenity of temper, is another. Humour is an efficacious antiseptic—a powerful tonic. So long as we can laugh, we are immune from defeat; there is still some heart in us for the great business of noble living.—MEREDITH NICHOLSON, in an American Exchange.

PLATE 172.—BRISBANE GRAMMAR SCHOOL GROUP.

On the occasion of an instructional visit to the laboratories of the Department of Agriculture and Stock. Seated in the centre are Messrs. Boyle (Agricultural Branch), Dakin (Teacher in Charge), and Kilmartin (Interviewing Officer).

Chloris Grasses in Queensland.

By S. L. EVERIST, Assistant to Botanist.

PART I.

THE genus *Chloris* includes a number of grasses of considerable economic importance. Perhaps the best known of these is Rhodes Grass (*Chloris Gayana*), but several native species are also useful pasture grasses.

Chloris grasses are easily distinguished by their seed heads. These usually consist of a number of spikes spreading out from the top of the seed stalk. Upon the lower side of each of these spikes are borne a number of spikelets or "seeds." These are arranged in two rows and consist of two outer empty glumes, thin in texture, with between them two or more "flowers" or florets. The florets break away above the glumes and fall, leaving the glume attached to the seed spike. The lemma or outer husk of the lower, or fertile floret bears a long awn. Above the fertile floret are one or more empty glumes, each of which also bears an awn.

Botanical Name.—Chloris, the goddess of flowers.

Common Names.—Most of the *Chloris* grasses are known as Star Grasses, Windmill Grasses, or Umbrella Grasses. These names, however, are applied to a number of different grasses with spreading seed spikes and are not confined to *Chloris* grasses. The name *Chloris* is short and euphonious, and should be quite a good common name for members of the genus. This would also eliminate the chance of confusing them with other grasses known by the above vernaculars.

Botanical Description.—Spikelets with one perfect floret and one or more male florets or empty lemmas above it. Spikelets sessile, crowded in two rows on one side of slender, solitary or digitate spikes. Glumes two, persistent. Rachilla disarticulating above the glumes. Lower floret hermaphrodite, lemma narrow, 3-nerved, apex usually 2-lobed and bearing an awn from the sinus; palea almost as long as the lemma, membranous, 2-keeled. Lodicules two, glabrous. Stamens three. Ovary glabrous, styles short, distinct; stigmas laterally exserted. Second floret male or barren. Lemma as in the fertile floret, but smaller. Palea, if present, membranous. Sometimes there is an empty lemma above the second floret. Grain linear or oblong, triquetrous, flattened, or concavo-convex.

Annual or perennial grasses, often with a creeping habit.

THE DIFFERENT KINDS OF CHLORIS GRASSES.

There are about eleven native species of *Chloris* grasses at present known in Queensland, and most of these are of some importance in the native pasture.

Two closely allied species are *Chloris divaricata* and *Chloris acicularis*. These, however, may be easily distinguished. *C. divaricata* is a small, fine-leaved plant which creeps along close to the ground. The young leaves are folded and the young shoots flattened. The spikes of the seed heads, too, are slender, weak, and somewhat flexuous. *Chloris acicularis,* on the other hand, has rigid, upright stems, and only

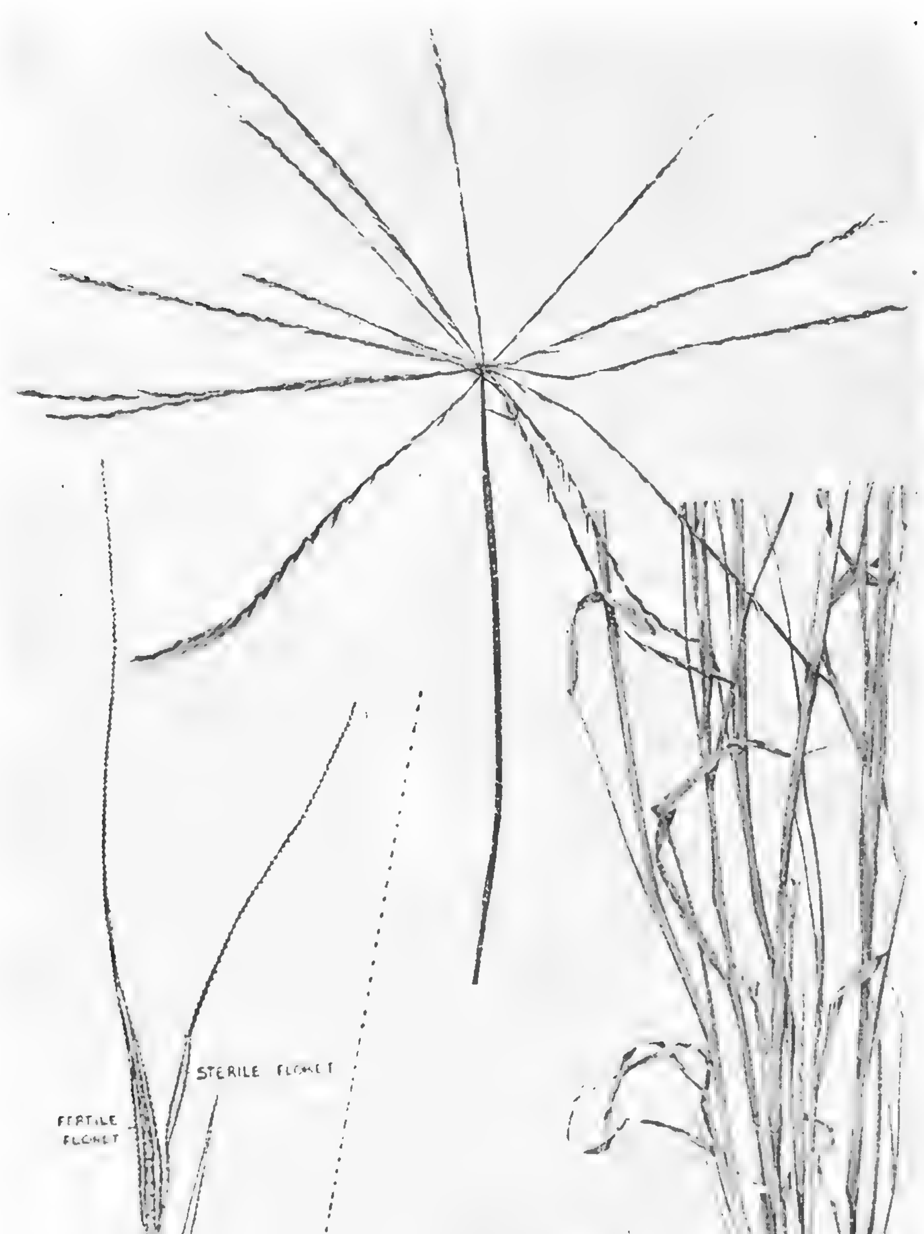


PLATE 173.
Chloris acicularis.

occasionally runs along the ground. The leaves are rather hard and coarse, and are a pale bluish colour. When mature, the old leaves are strap-shaped and curly. The seed spikes are rigid and stiffly spreading. In addition, the spikelets of *C. acicularis* are larger than those of *C. divaricata,* and the "husk" passes into the awn with very little indication of lateral teeth, the lateral teeth of *C. divaricata* being much more prominent.

CHLORIS DIVARICATA.

Botanical Name.—*divaricata,* from Latin *divaricatus*—spread asunder, referring to the spreading seed spikes.

Botanical Description.—Stoloniferous perennial, sometimes tufted; stolons slender, branched, rooting at the nodes and sending up flattened leafy shoots. Lower leaf sheaths rather short, distichous, flattened and keeled. Sheaths of flowering culms not keeled. All sheaths glabrous, striate, with scarious margins. Ligule a ciliolate rim, auricles short, bearded, sometimes glabrous. Leaf blades folded in the bud, folded or flat when mature, mostly pale green and glabrous, sometimes with a few long hairs near the base. Nodes and internodes glabrous, leaf sheaths exceeding the internodes.

Spikes 3-10 or rarely more, usually 5 or 6, slender, somewhat flexuous, spreading. Base of spikes and apex of flowering culm very shortly ciliate. Rachis of spikes scabrous. Spikelets crowded, imbricate, sessile, in two rows on the lower side of the rhachis. Lower glume small and membranous, 1-nerved, 0.5-1.5 mm. long. Upper glume thin and membranous, 1-nerved, acute, 2.5-3.5 mm. long. Lower lemma somewhat indurated and usually dark coloured at maturity, scabrous, rounded on the back, obscurely 3-nerved, up to 4 mm. long. Apex usually bidentate and with a long, slender, scabrous awn from the sinus. Lateral teeth short, acute, not awned. Palea almost as long as the lemma, membranous, 2-keeled. Lodicules two, small, glabrous. Stamens three. Ovary glabrous, styles two, short, distinct, stigmas laterally exserted. Grain linear, almost as long as the lemma, triquetrous, pale brown and shining when ripe; embryo large. Rachilla produced above the fertile floret and bearing a single empty lemma similar to the lemma of the fertile floret, but smaller and thinner in texture.

Distribution.—*Chloris divaricata* is widely distributed in Queensland and is found in all parts of the State, from the coastal islands to the Northern Territory.

Habitat.—This grass grows on practically all types of soil, from heavy black soils to light sandy loams. In the interior it seems to favour the edge of the black and red soil areas.

Fodder Value, &c.—Recently, *Chloris divaricata,* togther with some other species of *Chloris,* has been brought under notice as a fodder grass of considerable importance. Though it runs to seed very quickly, it forms a very thick bottom growth, due to its running habit, and under heavy stocking tends to spread out and form a sward. Sheep are fond of the herbage, and analysis shows it to be fairly nutritious. After rain it comes away very quickly, and forms a good cover of palatable fodder. Apart from its value in the inland pastures, *Chloris divaricata* has been used experimentally for lawns and, in at least one case, for a bowling green. In this capacity it is said to have excellent possibilities, and seems worthy of further trial.

Reference.—*Chloris divaricata* R. Br., Prod. i, 186 (1810).

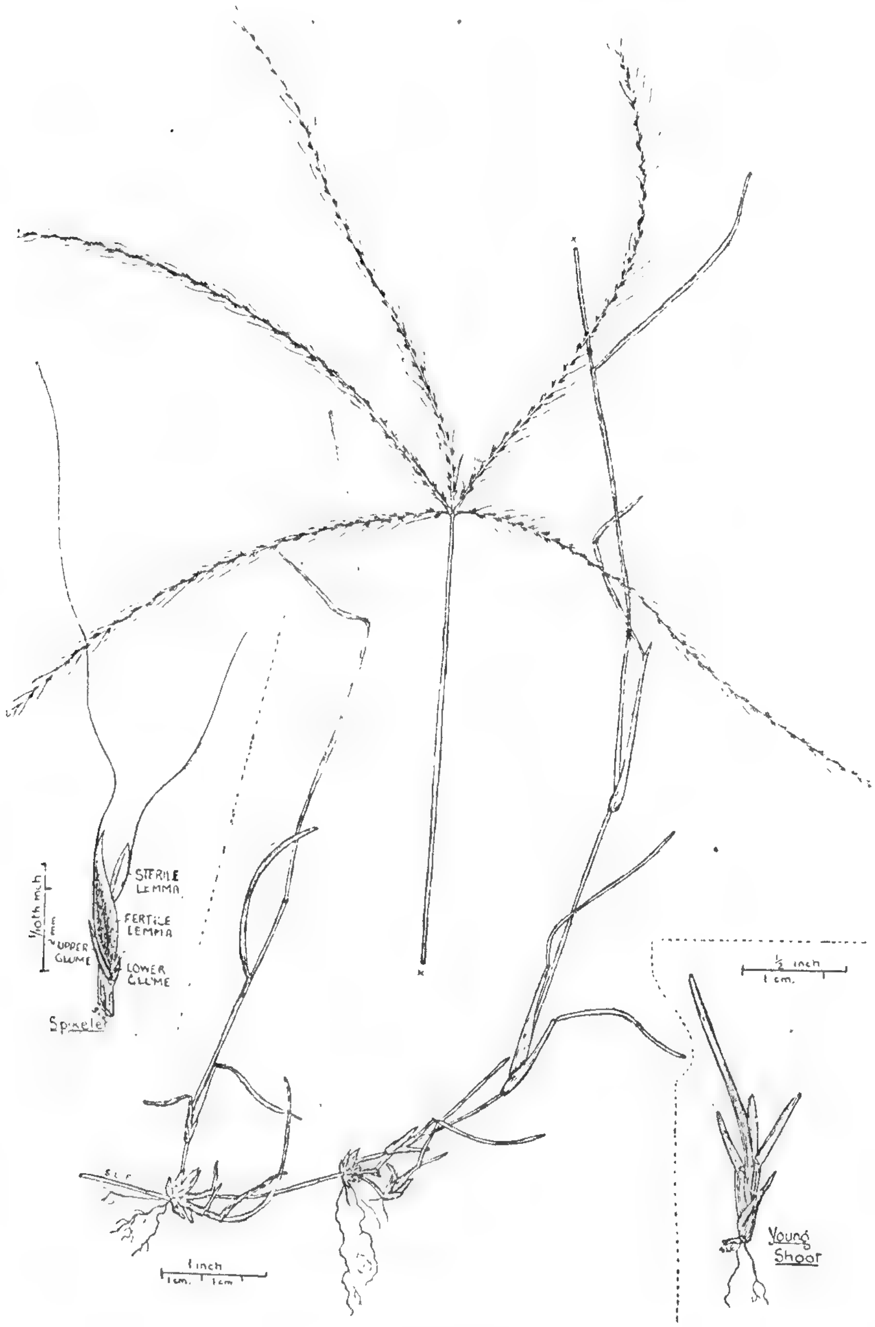


PLATE 174.
Chloris divaricata.

CHLORIS ACICULARIS.

Botanical Name.—*acicularis,* from Latin *acus*—a needle, referring to the needle-like lemma of the fertile floret ("seed").

Botanical Description.—Tufted perennial, usually branched at the base and from the lower nodes. Culms erect, hard and wiry, terete, smooth, nodes somewhat swollen, glabrous. Young shoots not flattened. Leaf sheaths shorter than the internodes, tubular, glaucous, strongly striate, and somewhat scabrous, usually bearing a number of tubercles. Ligule reduced to a ciliolate rim, auricles small, sometimes long bearded, sometimes glabrous. Leaf blades glaucous, convolute when young, usually flattened and curly when old, glabrous or hairy. Leaf blades strongly nerved, up to 20 cm. long and 0·4 cm. broad. Spikes 4-12, rigid and stiffly spreading. Spikes swollen, and silky villous at the base. Rhachis scabrid. Spikelets imbricate, crowded in two rows on one side of the rhachis. Glumes 1-nerved, narrow, keeled, acuminate, scabrid near the keel, lower 3-4 mm. long, upper 7-8 mm. long, narrowed into a fine point. Lower lemma up to 6 mm. long, indurated at maturity, scabrous, 3-nerved and dorsally keeled, with a deep groove on each face. Within each groove are a number of spinulose hairs. Lemma tapering into a scabrous, 15 mm. long awn. Lateral teeth very minute and inconspicuous. Base of the lemma with a fringe of long hairs round the callus. Palea membranous, 2-keeled, hairy on the outer face, almost as long as the lemma. Lodicules 2, stamens 3, ovary glabrous. Grain linear, flattened or concavo-convex, 5-6 mm. long, embryo large. Rachilla produced above the fertile floret, smooth and quite glabrous. Upper floret barren, consisting of a narrow, scabrous, awn-like lemma which passes almost insensibly into a fine, scabrous awn.

Distribution.—In Queensland it occurs over most of the State, with the exception of the coastal districts, though it has been collected at Gatton.

Habitat.—*Chloris acicularis* does not seem to favour any particular type of soil, though it is very common in Brigalow country.

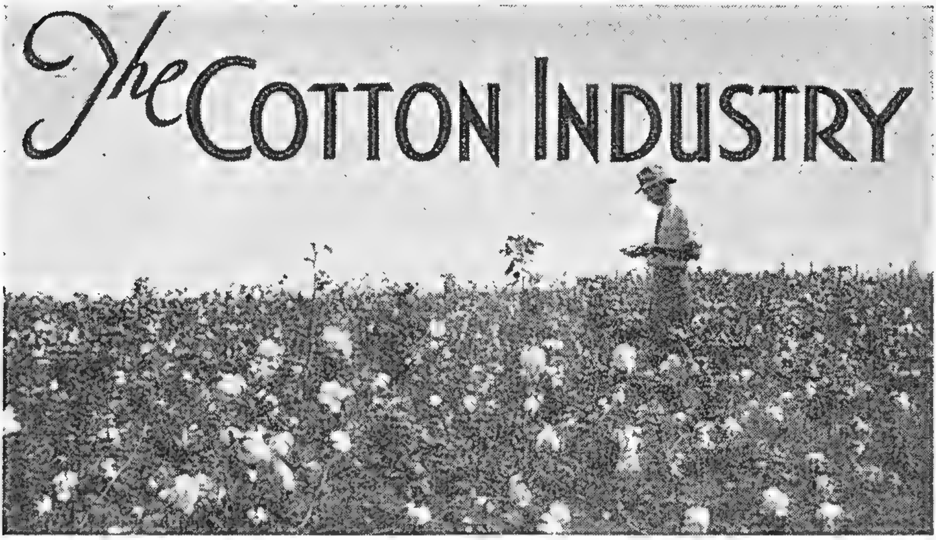
Fodder Value, &c.—Little is known definitely of its fodder value, but it is readily eaten by stock, and in some places is looked upon as quite a good fodder. Like most of the other native *Chloris* grasses, it should repay investigation as a pasture grass.

Reference.—*Chloris acicularis* Lindl., in Mitch. Trop. Aust., 33 (1848).

[TO BE CONTINUED.]

EFFICACY OF THE CARBON TETRACHLORIDE DRENCH.

Since it has been stated that repeated drenching with carbon tetrachloride exerts an ill effect on the livers of sheep, the Director of Veterinary Research of the New South Wales Department of Agriculture recently conducted a field trial in collaboration with the Inspector of Stock at Glen Innes to determine the point. This trial showed that, even when drenched fortnightly with 2 c.c. of carbon tetrachloride, the sheep suffered no ill effects; in fact, they improved in condition. At the termination of the trial these sheep were sold for mutton, and there was no evidence of permanent damage to the liver.



Snapping Cotton.

By W. G. WELLS, Director of Cotton Culture.

THE term "snapping cotton" refers to the operation whereby the cotton crop is harvested by snapping off the entire cotton boll rather than by picking only the seed cotton out of the open boll. The custom originated in the north-western portion of the main cotton belt in the United States of America during periods of scarcity of labour. Only a small percentage of the crop usually opens before the first killing frosts are experienced in this district, and generally the temperatures are sufficiently low to kill the plant so that the bolls are brittle and come off easily with a snapping motion. Considerable difficulty was at first encountered in cleaning and ginning such cotton, but the cotton gin manufacturers, realising the probability of the custom becoming established, eventually devised machinery which cleans snapped cotton in a remarkable manner. This has resulted in snapping being used extensively in the United States wherever labour is scarce or the cost of picking is excessively high.

Snapping in Queensland.

No facilities for treating snapped cotton were available in Queensland until following on the purchasing of the ginneries and oil mill by the growers from the proprietary company which first established them, when modern cleaning machinery was installed at the end of the 1931-32 season in the Glenmore Ginnery, Rockhampton. Special arrangements were made with several growers to send in consignments of snapped cotton to test out the machinery, and the results obtained indicated that snapping could be practised to advantage. Accordingly, growers in the Upper Burnett and the Callide and Wowan districts were allowed to snap in the 1932-33 season, which was marked by very low rainfall—exceptionally light yields mostly being the rule. Much of the crop in these distrcts was snapped, and the results obtained indicated that the

method was entirely suitable for such dry conditions. The Whinstanes Ginnery was therefore equipped in the 1933-34 season in order that all the cotton-growers could snap their crops if desired.

Snapping Results in the 1933-34 Season.

The harvesting period of that season, however, experienced the wettest conditions over the whole of the cotton belt of any in recent years. Showery, cloudy weather interspersed with cool nights and heavy fogs made the plants so tough and leathery that they were unsuitable for harvesting the crop by the snapping method. The showery conditions also delayed the gathering of the harvest, and many growers made only one fairly heavy first picking and then snapped the rest. The result was most unsatisfactory. Not only was the cotton often damp, but the toughened leaf and burr—as the outer part of the opened boll is named—became so matted in the fibres that it was impossible for the machinery to clean the latter in a proper manner. When dry, properly snapped cotton was sent in, however, an excellent cleaning of the fibres was effected.

Snapping Suitable in Queensland.

Snapping undoubtedly has a place in the harvesting operations of the Queensland cotton-grower, but should he practised only when the conditions are suitable. These conditions are that the burrs must be dead and brittle, most of the leaf should have fallen off, and the burr and cotton must be dry. Snapping from green plants not only tears off pieces of the fruiting branches and strips of the green bark, but also green leaf is gathered with the cotton. Such material contains moisture, and when pressed tightly into a wool pack undergoes a "sweat" which tends to make the fibres stick to it so tightly that it is difficult to remove anything but the largest particles, such as the burrs and branches, during the cleaning operations. Another argument against snapping when the plants are green is that the grower pays for picking heavier foreign material, and the Cotton Board pays more freight charges than if the contents of the containers are all thoroughly dry. These are important economic factors, especially for growers with large acreages, for it must be remembered that the ginneries are equipped with driers, and where cotton is damp it is dried before it is weighed for payment.

In respect of picking and freight charges, growers should pay more attention to the quality of the snapping. During the 1933-34 season some consignments of snapped cotton came in which were of such low grade that they were not accepted. Such cotton contained not only an excessive amount of leaf, but a high percentage of empty burrs, the cotton of which had obviously been hand-picked earlier in the season. A large number of completely diseased bolls and hard worm-eaten dried-up bolls—or "hickory nuts," as they have been named—were also included. Growers allowing such snapping are simply paying excessive net harvesting costs for their cotton, and, in addition, the quality of the already low-grade lint is further lessened through the fibres becoming so badly mixed with the foreign matter that the cleaning machinery can remove only a small proportion of it.

What to Snap.

In normal seasons it is recommended that only the top crop be snapped. Usually the plants do not die sufficiently prior to the maturing of the top crop to make them suitable for snapping. Some growers follow the practice of leaving the crop open until a heavy first picking can be made and then waiting until frosts open the top crop, when everything on the plants is snapped. Unless only a very light second picking can be made, it is not recommended that this method be followed. In any variety of cotton the fibres in the top bolls are shorter than on the rest of the plant, and generally softer and weaker. Usually in Queensland the lint of the top crop also contains considerable yellow spot, caused by bacterial diseases entering punctures made in the green bolls by sucking insects. Where the late middle and top crop is snapped together, the grower undoubtedly loses the value of considerable cotton of much higher quality than that of the top crop. This was noticed in many consignments received at the ginneries in the 1933-34 season. Owing to the late, showery conditions a large percentage of the top crop was badly spotted. Growers who sent in dry cotton composed of the upper middle and top crops were disappointed with the grades they received, for much of the bolls had contained excellent cotton. The mixing with the spotted top crop, however, made the resultant lint so badly discoloured and of such wasty nature that only low grades and staples could be given it, although it was obvious that a high percentage of the fibres were of superior quality.

Varieties Suitable for Snapping.

It has been found in the U.S.A. that some varieties are much more suitable for snapping than others. Investigations are being carried out in Queensland by the Department of Agriculture and Stock to ascertain if similar differences occur here. Growers with more than one variety should study this point as well, to ascertain the effect of their own soils, and report their observations to the Department.

The ideal boll for snapping is one in which the burr comes away freely from the stem, by which it is attached to the fruiting branch. Such a boll if snapped after the leaves have fallen not only gives the minimum quantity of trash in the containers forwarded to the ginnery, but owing to the divisions breaking apart is easily separated from the seed cotton in the cleaning machinery. The grade of cotton snapped in such condition is generally practically equal to the grade that would have been obtained had the cotton been hand-picked. Spinning tests carried out in the U.S.A. have shown that the lint obtained from properly snapped cotton which has been treated with modern cleaning apparatus compares favourably with hand-picked cotton.

It is believed, therefore, that if growers pay greater attention to the points which have been touched upon, more satisfactory results will be obtained with the snapping method of harvesting. Most of the snapped cotton will naturally be of low grade in Queensland on account of the spotted condition of the lint of the top crop, which is the only part of the crop that should be snapped under ordinary conditions. This is well worth harvesting, however, especially where a grower has a large acreage, for the net value obtained will often be a substantial contribution, especially in seasons of late frosts.

Snapping may delay Preparation of New Seed-Bed.

It is pointed out, however, that growers should guard against snapping so late in the season as to delay the preparation of the seed-bed for the next crop. Rains generally occur during the first half of June in all the main cotton-growing districts, and every effort should be made to use this moisture to the fullest advantage in preparing the new seed-bed. July and August are mostly dry months, and on the older cultivations of the heavier clay loam or clay types growers frequently experience great difficulty in completing their ploughing if the start of the operation is delayed too long, especially men with large acreages. Experiments and the experiences of growers have demonstrated clearly the advisability of growing cotton in rotations with grass and fodder crops, and it is recommended strongly that where a grower with a large acreage practises snapping, a portion of the acreage for the next season should follow some crop that will allow of preparation of the seed-bed ahead of the June rains. This will allow of ample time to plough the portion following cotton, and will also reduce the effects of any delay in snapping the crop due to unfavourable climatic conditions, shortage of pickers, or any other detrimental circumstances.

PLATE 175.

Erosion on a Queensland Farm.—Note deep gullies in course of formation on what was formerly level alluvial land.

Classing Cotton.

By R. W. PETERS, Cotton Experimentalist.

Historical.

What is the value of my cotton? is a query that has always concerned cotton growers the world over, when, having harvested the crop, they have forwarded it to the ginnery. In the early periods of cotton growing no attempt was made to evolve any standards which would allow of some rough estimate being placed on the value of any particular cotton. The crop was sold on a basis of bargaining, or in the case of fancy cottons, by contract between the grower and manufacturer. The rapid development of both the cotton growing and spinning industries became of such importance, however, that obviously some system of standards to assist in the selling of such an important commodity had to be developed.

The earliest records of cotton classing extend back to 1800, when cotton arriving at Liverpool, which was the centre of the cotton manufacturing world at that time, was identified by various terms which designated its quality and source of origin. Gradually this custom extended with modifications to other centres—especially the United States of America, where the bulk of the world's crop was produced. As cotton spinning was introduced into other countries new sets of terms originated, with the result that a large series of standards were operating at the various consuming centres.

It was realised eventually that some general uniform system should prevail, and accordingly the Department of Agriculture of the United States of America prepared a set of World's Universal Standards for American Upland cotton which were finally accepted by the Cotton Exchanges throughout the world. Approximately every two years the Officers of that Department prepare new sets of standards, which are passed upon by representatives of the various cotton exchanges, who meet in conference at the main classing rooms of the Department of Agriculture at Washington, D.C. Hundreds of copies of the sets finally agreed upon are then prepared for sale as reference types to purchasers of American Upland cottons.

These standards have greatly simplified the selling of American Upland Cotton and have also made it possible for the purchaser to buy cotton on description without the examination of actual type samples. Daily quotations of American cottons of the range of the World's Universal Standard Grades and of the various staple lengths are made in the main cotton exchanges throughout the World. It is thus possible to form a reasonably accurate estimate of the value of any American types of cotton as soon as the grades and lengths of fibres are known. This fact is of great importance to the Queensland cotton growers as only varieties of American cottons are grown here in any quantity.

Cotton Classing in Queensland.

As the cotton being grown in Queensland at the commencement of the present industry was of the American Upland type, the World's Universal Standards were adopted as a basis for the preparation and marketing of the crop, so that the grower could obtain the full value for

his produce. This method has been found suitable for Queensland cotton and is now used in grading it. The Queensland crop, being handled through a Commodity Pool, makes it necessary to class each container of seed cotton as it arrives at the ginnery, in order that an estimate of its quality may be made and an initial payment of around 80 per cent. of its value may be sent to the grower. This system of classing is carried out by a staff employed by the Queensland Government. The graders are mostly former qualified wool classers trained for several years by an experienced cotton classer, who had classed types of cotton similar to those grown in Queensland, not only in Liverpool but also in the United States of America.

PLATE 176.
Ripe for the Harvest.—A Field of Cotton, Mundubbera.

When the container of seed cotton arrives at the ginnery the contents are examined by a grader, who first determines the grade and then the length of the fibres, or staples it, as the operation is termed. Each container is then weighed, check weighed and checked against the amount of cotton the grower states on his advice note that he is sending to the ginnery, after which it is segregated into the proper stack for ginning according to the grade, staple, and variety. When the cotton is being ginned two samples are drawn from each 500 lb. bale of lint in such a way as to represent the average contents. These samples are sent to the classing room, where they are graded and stapled under an even light. Every bale is classified against a set of lint standards of Queensland cotton which is based on the key set of Universal Standards for American cotton that are obtained from the United States Department of Agriculture every time new reference sets are made. The average contents of each bale of lint are thus known, and also the grade and staple of each container of seed cotton from which the bale of lint was obtained. This enables the grader of the seed cotton to check on his classifications throughout the season, and thus ascertain if the seed cotton is producing lint of the quality he has estimated.

When the system of grading the Queensland crop was first started it was believed that it would be more equitable for all concerned if rather broad grades of seed cotton were used rather than try to class exactly to the lint grades of the Universal Standards. The resultant bales of lint were classed according to these Standards, though, with fairly satisfactory results. Certain weaknesses in the system have become apparent, however, with the expansion of the industry. Accordingly, as the new Commonwealth Bounty Scheme, which came into force with the harvesting of the 1934-35 crop, necessitates the establishment of a set of grades for lint cotton, a new system has been inaugurated whereby the lint of each container of seed cotton arriving at the ginnery will be classed in terms of the grades used in the

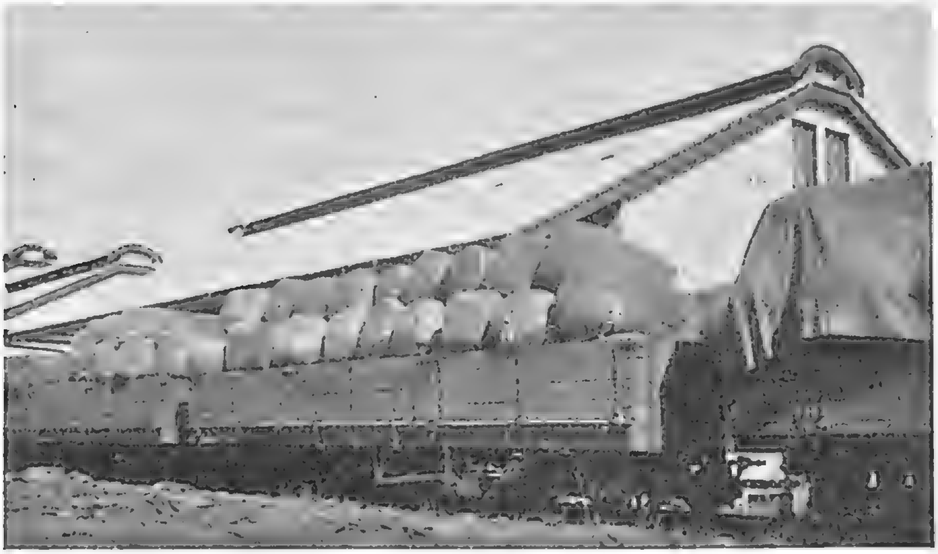


PLATE 177.

Queensland cotton arriving at the ginnery. Second-hand wool packs are used for sending in the bulk of the crop. On an average 500 to 550 lb. of seed cotton is packed in each bale.

Universal Standards. This will be a decided improvement over the old system, for in some of the grades of seed cotton previously used cottons of a wide range of quality were paid for at the same rate. Under the new system the grower will receive a price for his cotton which will be directly commensurate with that realised from the ginned consignment. There will thus be every inducement to produce cotton of good quality.

Queensland Grades.

Although the World's Universal Standards for American Upland cottons are the basis for the classing of Queensland cotton, it has been found necessary to deviate from them somewhat on account of the tendency for a considerable proportion of the Queensland crop to contain more spot than the Universal Standards will allow in the white grades. Accordingly the Queensland crop is classed into white, light spotted, and yellow spotted grades, the white grades being equivalent to the Universal Standards in all respects, with the light spotted having the same amount of colour, trash, or foreign matter as the white

grade but containing more spot. The yellow spotted grades also contain the same amount of trash as their comparable white grades but have a decided yellow tinge and may also be of softer cotton than allowable in the mature white grades. The following grades are used in classing the Queensland crop—Middling Fair being the highest and Ordinary the lowest grades:—

White Grades.	Light Spotted.	Yellow Spotted.
Middling Fair	..	..
Strict Good Middling	S. G. M. light spotted	..
Good Middling	G. M. light spotted	G. M. yellow spotted
Strict Middling	S. M. light spotted	S. M. yellow spotted
Middling	M. light spotted ..	M. yellow spotted
Strict Low Middling	S. L. M. light spotted	S. L. M. yellow spotted
Low Middling	L. M. light spotted	L. M. yellow spotted
Strict Good Ordinary	..	..
Ordinary	..	..

Factors Determining Grades.

The factors determining the grade of a sample of cotton may be roughly described as—colour, amount and nature of foreign matter contained, and in lint cotton, the condition in which the ginning has left the fibres. All of the grades higher than Strict Middling must be of good colour and have a decided "bloom" or freshness of appearance. Each successively lower grade than Strict Middling becomes progressively duller of colour until the lowest is of a greyish appearance. There is a comparable scaling down in the amount of trash, leaf, etc., in the different grades, the Middling Fair carrying practically no foreign matter, while the Ordinary is well mixed with both large and small pieces of leaf, burrs and bits of seed. All of the grades above Strict Middling can carry but very little fine spec or "pepper leaf" as it is called. The ginning effect on the fibres is most important for the different lengths of fibres have to be ginned at different rates of feeding of the seed cotton to the gin-saws. Where this is not carried out properly much cutting of the fibres occurs, especially if the fibres are of a softish character or are damp either from rains or from being "green" as cotton is called, that has been picked too soon after the bolls have opened. Gin cutting or ginning when the cotton is damp gives a very wasty, uneven appearance to the lint and a bale of such quality is penalised, for in the spinning operations a high percentage of loss is obtained.

Character of Cotton Fibres.

Another factor taken into consideration when grading or valuing cotton is the character of the fibres. This term, broadly speaking, is based on the strength, body, drag, or twist of the fibres and the degree of neppiness of them. The fibres of a cotton of "good character" are

of good strength and body, have a decided drag when a sample is broken apart and contain very few "neps." The latter term is used to describe small bunches of fibres which tend to roll up and mat together so tightly that the spinning machinery cannot straighten them out. Generally speaking, a cotton of good character gins and spins well. A cotton of poor character, on the other hand, does not gin well, for it generally becomes of a very wasty appearance, with many gin cut, shortened fibres and a large amount of neps. Such cottons usually are the result of either growing unsuitable varieties or of adverse environments, such as lack of proper cultural methods and exceptionally dry hot conditions.

Stapling Cotton.

Stapling cotton means to obtain the average length of the bulk of the fibres. This is an operation which requires years of practice for one to become thoroughly proficient in it. An experienced classer can usually form a very close estimate of the working length of the fibres and in the course of making the determination also notices the amount of waste, neps, short fibres and uniformity of the bulk of the fibres. Generally cottons are measured in 1/16th of an inch gradations although in very uniform cottons it is possible to staple to 1/32 of an inch.

Points for Growers to Observe.

Much depends upon the individual grower, especially during the process of harvesting, as to what his cotton will be worth and every factor adversely affecting the quality of the lint should be guarded against. When packing a container every care should be taken to have only one grade and staple in it. A bale of lint is sold on the basis that it is of a uniform content. If there is decided variation of quality encountered it is purchased on the value of the lowest grade and shortest staple contained. Many large growers allow pickers to empty their picking sacks directly into the wool pack, and where this is done layers of markedly different grades often result, owing to the variation in quality of picking. It is recommended that a grower should grade his crop into at least three grades, such as clean, leafy, and stained, with a wool pack for each. As each picker brings his cotton forward for weighing, it should be graded and then emptied into the proper container. If such a system was practised generally the grower would often obtain a better value for his cotton, and more regular cotton would be fed to the gins, which would assist in the greater production of uniform bales of lint. In the United States of America the custom is to empty picker's bags into a waggon, distributing the contents over the whole surface, thereby obtaining an even blend. On arrival at the ginnery the seed cotton is taken out of the waggon by means of a movable suction spout, which results in an additional blending. It can be seen, therefore, that more attention should be paid here to sending in containers of uniform content.

Some growers seem to think it desirable to pack their bales as heavily as possible, especially when transport charges are high. It is pointed out, however, that when the bale is packed so tightly a certain amount of sweating occurs with the result that not only does the cotton open up in a hard cake-like mass which is difficult to blend, but the fibres are so embedded into any foreign matter that it is difficult to free them of it in the ginning process.

Undoubtedly growers should pay close attention to the points which have been touched upon. The present carry-over of large stocks of cotton in various parts of the world, and the intense competition which is going to take place between cotton producers in the future, make it imperative to produce the best possible cotton and prepare the finished product in the most satisfactory manner, in order to compete profitably on the world's market. Countries failing to do this will be marketing at a disadvantage. This is especially true regarding Queensland cotton, with the high transportation charges and the amount of the crop that will normally be exported.

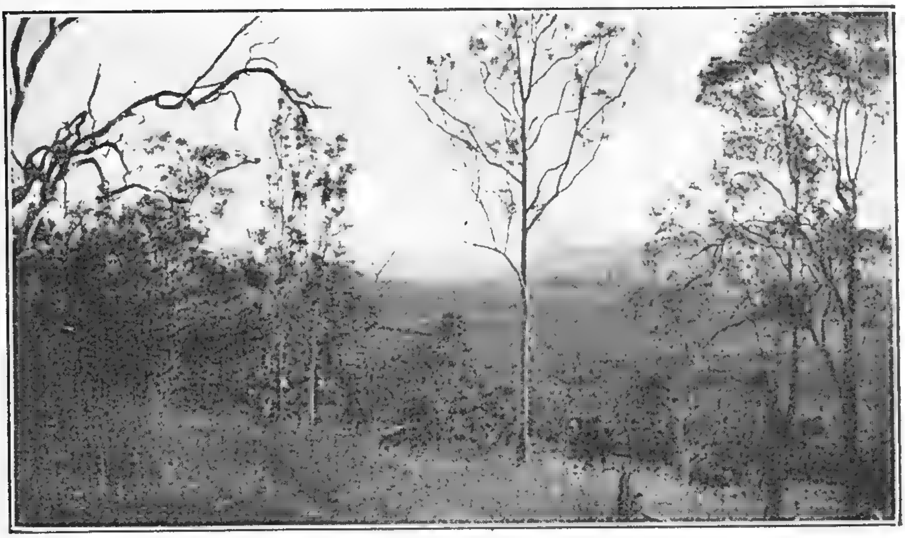


PLATE 178.
Amid the Farmlands of Fassifern.

THE dry conditions obtaining throughout the agricultural districts during March have continued and, at the time of writing, rain is urgently required to freshen the pastures and permit the cultivation and sowing of land for winter crops. The absence of any normal wet season rains has caused the usual seasonal decline in dairy production to become more pronounced. Lucerne cuttings have been light, and as a result of the demand for fodder occasioned by the serious drought in the western pastoral districts prices have risen considerably.

Maize.

Some good crops are being harvested in the Mary Valley and similar favoured areas, but elsewhere yields will be below normal. Many crops failed for grain purposes, and were therefore utilised for fodder. Excellent prices are being received, and growers who were able to store the grain in tanks are now reaping the benefit.

Fodder Conservation.

This subject crops up periodically during periods of scarcity, to be again allowed to lapse with the return of good seasons. It is quite impossible to ensure a continuity of nourishing feed without conserving fodder, or, in the more favoured districts, by laying down improved pastures. High quality wool, mutton, and beef can be produced if stock are not allowed to suffer periodical setbacks in their condition. Experienced western partoralists consider it impracticable to conserve bush hay during good seasons, owing to the sparseness of the native grasses, the large areas and numbers of stock to be dealt with, and the difficulty of obtaining labour. Consideration, however, could be given to the purchase of commodities such as lucerne hay and maize during normal years when prices are not unduly high, and to their storage at the point of consumption, or, alternately, to the purchase of rich farm lands by the pastoral organisations, who could then engage in the regular production of their requirements. This should be preferable to buying grain and fodder at exorbitant rates during drought periods.

Wheat.

Land is now receiving the final preparation prior to sowing when weather conditions permit. Cultural operations have been considerably retarded, owing to the dry conditions making the land too difficult. Fortunately the sowing of suitable varieties may be extended to July, the chief difficulty at present being the sowing of crops for winter feed. The sowing of winter grasses and clovers has been similarly retarded, which is unfortunate in view of the increasing attention now being given to this practice.

The census of wheat varieties grown during the 1934-35 season shows that Florence has retained its position as first favourite, the five chief varieties being as follows:—

Variety.	Acres.	Percentage of Total Crop.
Florence	46,682	16·27
Three Seas	44,924	15·67
Flora	33,951	11·84
Gluyas	24,392	8·51
Pusa	23,388	8·15

Three Seas has increased its area and will probably exceed Florence in the near future owing to its comparative freedom from rust and ability to yield heavily on a variety of soils. However, the quality of the grain is inferior to Florence or Flora.

Sugar.

With the exception of the Burdekin, weather conditions throughout the sugar areas during April were showery and cool. While soil moisture was generally satisfactory, the reduced temperatures were not conducive to vigorous crop growth. This month, preliminary crop estimates will be prepared; on the present prospect it is probable that the total tonnage for the coming harvest will be substantially less than that of the 1934 season.

Tobacco.

Most of the crops in the Texas, Inglewood, Miriam Vale, and Bundaberg districts have been harvested, and many of the growers are commencing grading operations. In the northern areas where adverse conditions were experienced with early plantings, crops now give promise of returning good yields. Splendid rains received in most of the districts at the end of February entirely altered the position, the early planted crops which were either dying off or prematurely ripening, filled out and the resultant cures are turning out satisfactorily. The late planted crops have made excellent growth and given fair conditions from now on will give excellent yields provided an early winter does not intervene and with it the usual curing difficulties. The long period of dry weather experienced in the early part of the season has been very beneficial in checking disease.

Cotton.

Dry and rather warm weather has mostly ruled throughout the main cotton-growing district during the past three months. Such conditions have greatly curtailed the crop prospects which appeared likely to be realised at the end of January. The plants were then generally

so very heavily laden that good rainfall was required for the rest of the season to develop the crop. The dry conditions which prevailed, however, caused a general loss of top crop and hastened the maturing of the bolls developed. Picking started in mid-February and has continued practically unabated through weather conditions very favourable for obtaining high grades. The picking tallies have generally been good, particularly in the big-boll medium staple varieties which have been distributed in increased quantities this season. Although the average yield per acre will probably be less than that of last season, when a record crop was produced, it is anticipated that a total yield approaching the previous one will be obtained as a greater acreage has been reported by the growers at mid-season as having prospects of producing yields.

The seasonal conditions have again demonstrated what an important part cotton should play in the cropping system of most of the agricultural districts away from the immediate coastal conditions. In most of these areas, particularly in the more inland ones in the Burnett and Central Districts, all fodder and grain crops have suffered most severely from the adverse conditions, while cotton crops, although checked, have yielded well enough generally to produce returns covering the costs of production or better. With one soaking rain at mid-January the average cotton yields would have been most appreciably increased while only moderate improvement would have been effected in other crops.

Crossbred Lambs.

Approximately 2,000 lambs raised under the Departmental scheme and sold in the open market, brought 4s. per head more than merino lambs of the same age. The average price of crossbred lambs four and a-half months old drawn from thirty farms was 17s. 8d; Border Leicester, Southdown Lincoln, Romney Marsh, Dorset Horn, and Shropshire rams were utilised, mostly from Southern Studs. These results are encouraging and farmers will be keen to experiment further with the various crosses with the merino.

Plate 179.
A Field of Maize below the Range.

Ulcerative Spirochætosis of Pigs.

By K. S. McINTOSH, H.D.A., B.V.Sc.

RECENTLY several cases of the above disease have been brought to the notice of this Station. Apparently it is the first time that the condition has been definitely diagnosed in Queensland and the object of this article is to supply pig owners with all the available information concerning the disease.

PLATE 180.
A typical skin lesion of Ulcerative Spirochætosis.

Mr. A. L. Clay, B.V.Sc., District Veterinary Officer at Cairns, was the first to make a tentative field diagnosis of the condition, which was confirmed at this Station on the examination of specimens.

The disease has also been diagnosed in material forwarded from Boonah.

Following this, a live pig affected with ulcerative spirochætosis was forwarded from the Maleny district and Mr. J. C. J. Maunder, B.V.Sc., Veterinary Officer, reported that fifteen pigs on a property in the Gayndah district were affected.

It is impossible to estimate the extent to which spirochætosis is present in Queensland at the present juncture. In New South Wales the condition is not at all uncommon.

PLATE 181.
Ulcerative Spirochætosis of castration wound. Note the protruding mass of "proud flesh."

Cause of Ulcerative Spirochætosis.

As the name denotes, the disease is caused by a spirochæte or spiral-shaped germ.

Apparently the germs gain entrance to the body through wounds and scratches of the skin or deeper structures. It is not uncommon to find the sockets of the teeth affected when the milk teeth are being shed, and it is frequently seen causing large abscesses following castration.

Other organisms are also present but are regarded as secondary invaders and not the primary cause.

Symptoms and Lesions.

When the spirochæte gains entrance to the tissues it seems to remain more or less localised. A swelling which appears in the skin and underlying tissues gradually enlarges, finally bursts, and a dirty

PLATE 182.
Sucker with mouthparts affected with Ulcerative Spirochætosis.

greyish pus is exuded. The ulcer so formed does not heal but gradually extends and becomes covered with a dark granular scab, usually adhering fairly firmly and having under it the pus already described. This lesion may be anything up to 6 to 9 inches in diameter. There is considerable new tissue, fibrous tissue, and dead flesh formation as a result of the chronic inflammation and the base of the ulcer is often fairly firm, but sometimes the pus extends inwards and affects the deeper structures also.

In the case of infection of the jaws during the shedding of teeth, the jawbone is attacked, resulting in channels of pus, dead bone, and loosening of teeth. The tongue often becomes ulcerated and large pieces of it may slough off altogether.

In the case of young pigs the disease is often fatal, but the older ones usually recover.

Control.

At the present time it is difficult to recommend any efficient method of treatment or control. Howarth, of the Californian Agricultural Experiment Station, recommends the incision of the castration swelling, or removal of the masses of dead flesh from the skin lesions; then dusting the cavity or skin lesions with a substance called tartar emetic. The inside of the cavity or the surface of the skin lesions should be covered with powder, but care should be taken in the case of castration wounds not to leave an excess of the powder in the cavity, lest absorption and poisoning should occur.

The disease is generally though not always associated with dirty, unhygienic, and badly managed piggeries.

In view of this and the fact that the disease is caused by a specific germ, the following control measures should be adopted:—

1. Isolate all pigs affected with the disease.

2. Clean and disinfect the yards, houses, troughs, &c., and keep them clean.

3. Do not use wallows or badly drained sties. Suckling sows and litters more especially should not be allowed access to mud and filth as the disease is particularly serious in young pigs.

4. Be particularly clean in the operation of castrating and keep the castrated pigs in a scrupulously clean place until the wounds have healed.

5. Discontinue the use of barbed wire about the yards, as this often produces wounds through which the germs may enter.

6. If lice are present apply crude oil to the skin of the pigs to destroy these parasites.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Litter Recording of Pigs.

SOME pig raisers are now carrying out litter recording and the results obtained are considered most valuable. The records of two litters, which were officially checked by officers of the Department recently, are so good that they should be interesting to all pig raisers.

Litter Record.

Owner—Hibberd Bros., "Grenier Park," Gold Creek, Indooroopilly.
Dam of Litter—"Gatton Pet,"—Large White.
Sire of Litter—"Norfolk Barron 2nd,"—Large White.
Litter Born on 21st February, 1935.

Tattoos.	40	41	42	43	44	45	46	47	48	49	50	51	52	53	Total.	Average.
Sexes.	B	B	B	B	S	S	S	S	S	S	S	S	S	S		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Weight at birth ..	3	3	2	2	1½	1½	2	2	2½	3	2½	3	3	3	34	2·4
Weight at 1 week	8	6½	4	4½	*	*	4½	3½	5	6	5	7	6½	6½	67	5·5
Weight at 2 weeks	14	10½	6	10	..	..	7	8½	9	9	8	10	9½	12	113½	9·4
Weight at 3 weeks	16½	13½	9½	10½	..	..	10½	8½	10½	13½	11½	13½	13½	13½	145	12·0
Weight at 4 weeks	19½	17½	12	14½	..	..	14	10½	13½	15½	13½	18½	16½	18	183½	15·3
Weight at 5 weeks	28	23	15½	20	..	..	17	14	17½	21	19	21	22	24½	242½	20·2
Weight at 6 weeks	34	28	17	26	..	..	21	18	21½	26	23	26	26½	29	296	24·6
Weight at 7 weeks	45½	39½	24½	33½	..	..	27	24½	30	32½	28	34½	32½	37½	389½	32·5
Weight at 8 weeks	53	47	29	41	..	..	34	29	37	38	36	42	41	46	473	39·4

* These pigs died on 22nd February, 1935.

Total Litter Weight at 8 weeks:—473 lb.
Average weight per pig at 8 weeks:—38·6 lb.
This was the sow's second litter, she having reared 10 pigs in her first litter.

Litter Record.

Owner—H. O. Rees, "Cethor" Stud, Maleny.
Dam of Litter—(Unnamed)—Middle White.
Sire of Litter—"Gladesville Prince"—Middle White.
Litter born on 21st February, 1935.

Tattoos.	19	20	21	22	23	24	25	26	27	28	Total.	Average.
Sexes.	B	B	B	B	B	B	B	S	S	S		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Weight at birth	3	3	2½	3	2½	2	1½	3	3	3	26½	2·6
Weight at 1 week	6	7	5	6	5	5	4½	6	6	6½	57	5·7
Weight at 2 weeks ..	8	10½	7½	9	8	7	6½	9½	8½	9	83½	8·3
Weight at 3 weeks ..	10	14	11	13	11	10	9	13	12	12	115	11·5
Weight at 4 weeks ..	15	20	17	19	16	14	14	19½	16½	18	169	16·9
Weight at 5 weeks ..	20½	26	24½	21½	21½	17½	19½	26½	21½	21	220	22·0
Weight at 6 weeks ..	26	31	31	29	27½	23	23½	32½	28	26½	278	27·8
Weight at 7 weeks ..	31	36	38	34	33½	28	28	38	31	33	330½	33·0
Weight at 8 weeks ..	37	42	42	43	39	33	32	44	36	38	386	38·6

Total Litter weight at 8 weeks:—386 lb.
Average weight per pig at 8 weeks:—38·6 lb.
This was the sow's first litter.

Field Day for Dairy Farmers

Gathering at Glencoe.

THE initial field day for dairy farmers of the Darling Downs was organised by the Glenorie Local Producers' Association under the Dairy Committee Scheme of the Dairy Cattle Improvement Act on the 16th April, at the farm of Mr. W. F. Kajewski, at Glencoe.

Among the fifty farmers present were representatives of the Glenorie, Kingsthorpe, Yalangur, and Boodua Dairy Committees.

A feature of the day was the parade of Mr. Kajewski's well-known A.I.S. herd. It included the head sire of his stud, the cows which were champions at Toowoomba Shows for 1934 and 1935, heifers which have been prize-winners at Downs Shows, and a number of splendid young stock. Not only are the animals prize-winners, but they have shown their worth in production by their entry into the advanced register of the A.I.S. Society.

Mr. C. F. McGrath, Supervisor of Dairying, outlined the objects of the Dairy Cattle Improvement Board in instituting field days and the lessons that can be learned from them.

He also ably demonstrated the points that a judge considers when cows are in the show ring, and by using several cows from the herd showed where they differed and how they would be placed if in competition.

Mr. O. St. J. Kent, Dairy Science Officer, gave an address on dairy hygiene. He dealt principally with the importance of cleanliness in the production of milk, and the care of cream on the farm in relation to quality in butter.

Demonstrations with the microscope revealed various organisms which have a harmful effect on dairy products.

Mr. G. B. Gallwey, Inspector of Accounts, spoke on marketing and allied subjects. Special attention was given to over-run and the factors which govern it. The operations of the Commonwealth Stabilisation Scheme were outlined.

Diagrams showing the imports of the various countries to Great Britain and the production and sales of the Australian States were explained.

Mr. C. R. Mulhearn, Veterinary Officer, gave an address on Mammitis and held a post-mortem examination on a cow. He explained the functions of the organs of the animal, pointing out where and what to look for in the common diseases of dairy stock. Many questions were asked and satisfactorily answered.

At the conclusion of the day Mr. W. Dearling, on behalf of the Glenorie L.P.A., thanked the officers of the Department for their attendance and the valuable and interesting information which they had imparted to those present. He also thanked Mr. Kajewski for allowing the L.P.A. to use his farm.

Mr. J. C. Brimblecombe, on behalf of the other L.P.A.'s, expressed appreciation of the fact that the Department had officers who were not only versed in the theory of their subjects but could carry out the practical work as well.

Mr. McGrath returned thanks and said that the Department was always willing at any time to render assistance to the farmer.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, production charts for which were compiled for the month of March, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Lucky 2nd of Wendella (365 days)	J. Phillips, Wondai	16,930·34	711·712	Daisy's Westbridge of Glenthorn
Glenice Moreen	R. Martin, Coalstoun Lakes	12,948·00	614·484	Perfection of Springdale
Upton Pidgeon 16th	H. F. Marquardt, Wondai	14,253·87	518·695	Kinsman of Greyleigh
Ada II. of Rockleigh	T. S. Strain, Wondai	11,043·94	451·099	King of Sunnyside
Happy Valley Myrtle 3rd	R. R. Radel, Coalstoun Lakes	9,631·00	394·767	Chief of Hillview
Valencia Dahlia	W. Turner, Riverleigh	9,633·5	390·5	Young Challenger of Blacklands
Rhodesview Nancy 5th	W. Gierke & Sons, Helidon	9,555·32	389·00	Birdwood of Blacklands
SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.				
Alfavale Model II.	W. H. Thompson, Nanango	12,229·6	561·433	Reward of Fairfield
JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.				
Wandegong Daisy	G. D. Lindenmayer, Mundubbera	11,552·75	396·337	Emperor of Spurfield
Aurora Johnny	Mrs. L. J. McCauley, Mundubbera	8,486·25	341·201	Jeans Reflex of Blacklands
SENIOR 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Sunnyview Evelyn II.	J. Phillips, Wondai	12,994·29	483·603	Lovely's Commodire of Burradale
Rocklyn Daphne	T. S. Strain, Wondai	10,196·61	398·877	King of Sunnyside
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Ruby VII. of Lemon Grove	J. Phillips, Wondai	11,677·03	528·63	Don of Greyleigh
Morden Favourite 6th	R. Mears, Toogoolawah	10,751·3	442·476	George of Nestles
Miss Jean 7th of Blacklands	A. Pickels, Wondai	9,415·89	324·903	Major of Blacklands

SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.				
Rhodesview Fanny 20th	W. Gierke & Sons, Helidon	8,342·85	331·669	Blackland's Prospector
Trevor Hill Snowball	G. Gwynne, Umbiram	6,532·1	262·065	Viceroy of Wilga Vale
JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.				
Rhodesview Kitty 7th	W. Gierke & Sons, Helidon	8,360·53	354·243	Blacklands Prospector
Trevor Hill Marigold	G. Gwynne, Umbiram	7,945·6	332·149	Viceroy of Wilga Vale
Chelmer Dahlia	H. F. Marquardt, Wondai	8,428·94	322·303	Gordon of Swanlea
Ettie 8th of Blacklands	A. Pickels, Wondai	9,046·34	319·122	Major of Blacklands
Hillfield Dulcie 3rd	S. J. Lester, Roadside	6,543·01	272·497	Mountain Home Royalist
Rocklyn Pearl	J. Reeves, Kingaroy	6,302·4	251·819	Oakvilla Don
Springland's Rosebud 4th	J. Reeves, Kingaroy	6,653·9	249·852	The Hill Hollywood
JERSEY.				
MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.				
Bellefaire Claire de Lune (365 days)	J. B. Keys, Gowrie Little Plains	11,537·16	630·086	Masterpiece Yeribee of Bruce Vale
Petal of Linwood	F. W. Kath, Ellesmere	7,020·5	436·809	Aerofoil of Banyule
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Glenview Starlight	F. P. Fowler & Sons, Biggenden	6,115·00	364·496	Trinity Officer
Inasfayl Fancy Larkspur 2nd	McGeehan Bros., Kairi	5,860·05	322·277	Werribee Starbright's Masterpiece 2nd
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Woodside Volunteers Countess	J. & R. Williams, Crawford	8,923·45	425·467	Rochette's Volunteer
Inasfayl Golden Maid	McGeehan Brothers, Kairi	6,482·95	296·819	Inasfayl Wyandotte's Noble
Kathleigh Pearl	D. Young, Kingaroy	5,757·55	291·604	Aerofoil of Banyule
Rosette of Curramore	R. M. Burnett, Maleny	5,178·45	281·546	Mannie of Curramore
Wyreene Ria	J. B. Keys, Gowrie Little Plains	4,299·6	253·199	Lyndhurst Majesty
Oxford June	W. Spresser & Son, Redbank	4,044·55	242·32	Oxford Ginger Boy
Carnation Fairy Lass (267 days)	W. Spresser & Son, Redbank	3,984·75	235·848	Vencheley Golden Victory (imp.)

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 2nd April, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for April, May, and June, 1935:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 14th May, 1935—"The Farmers' S.O.S.—'Save Our Soil,'" by J. F. F. Reid, Editor of Publications.

Thursday, 16th May, 1935—"General Problems in Plant Breeding in Queensland," by L. G. Miles, B.Sc., Ph.D., Plant Breeder.

Tuesday, 21st May, 1935—"Recording Pig Production," by L. A. Downey, H.D.A., Instructor in Pig Raising.

Thursday, 23rd May, 1935—"Housing and Management of Pigs," by L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 28th May, 1935—"The Prospects of Success with English Type Sheep in Queensland," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 30th May, 1935—"Frost Prevention by Orchard Heating," by H. Barnes, Director of Fruit Culture.

Tuesday, 4th June, 1935—"Grading Pig Products," by E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Thursday, 6th June, 1935—"Tropical Fodders—No. 1 Grasses," by C. T. White, Government Botanist.

Tuesday, 11th June, 1935—"Tropical Fodders—No. 2 Herbage," by C. T. White, Government Botanist.

Thursday, 13th June, 1935—"Shade Trees," by W. D. Francis, Assistant Botanist.

Tuesday, 18th June, 1935—"Some Native Grasses," by S. L. Everist.

Thursday, 20th June, 1935—"Artificial Incubation," by P. Rumball, Poultry Expert.

Tuesday, 25th June, 1935—"Queensland Nut Growing," by H. Barnes, Director of Fruit Culture.

Thursday, 27th June, 1935—"Citrus Culture," by H. Barnes, Director of Fruit Culture.

CAUSE OF CREAM CONTAMINATION.

Many a dairy farmer has been at a complete loss to understand the cause of a drop in the quality of his cream until he has brought the matter under the notice of the local dairy instructor.

A supplier to the Bellinger River Co-operative Factory (N.S.W.) was at a loss to know why his cream was being graded down. He had investigated the usual causes of cream contamination, but none of these provided a reason for the trouble. The matter was then investigated by the local dairy instructor, who found a very small crack in the separator milk float. This was so small as to go unnoticed, but it had allowed the milk to enter and putrify in the interior of the float. As a matter of fact, the float was almost full of a wet putrid mass, which, of course, was a fruitful source of contamination of the cream.

And the moral of this story is not so much to invite every dairy farmer to break open his separator milk float, as to invite them to seek the aid of the district dairy instructor when experiencing trouble in the maintenance of cream quality.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Grease Nut.

J.E.S. (Muan, Gayndah Line)—

Your specimen represents the Grease Nut (*Hernandia bivalvis*), a native of the scrubs of Southern Queensland. The tree apparently is not abundant anywhere, but seems to be most common in the scrubs about Biggenden. The seeds contain nearly 50 per cent. of a bitter oil. This oil has been examined chemically, but is not known to possess any commercial possibilities. The tree is well worth growing on account of its ornamental character.

Blue Grass, Barley Grass, and Small Flinders Grass.

V.W. (Macalister)—

1. *Dichanthium sericeum* (Queensland Blue Grass).—One of our best native grasses. The principal grass of the Leichhardt district.
2. *Panicum decompositum* (Barley Grass).—Regarded as good fodder only when very young. It soon becomes dry and unpalatable. The seed heads break off and blow away, hence one of its local names—Blow-away Grass. This name, however, is applied to a number of different grasses whose seed heads show the same tendency.
3. *Bothriochloa erianthoides* (Satin Top).
4. *Iseilema membranacea* (Small Flinders Grass).—An annual grass which comes away quickly after rain. Relished by stock even when quite dry.
5. Better material required for identification.

Wheel-O'-Fire.

H.F.M. (Dayboro')—

Your specimen represents *Stenocarpus sinuatus*, the Wheel-of-Fire, a native of the Northern Rivers of New South Wales and coastal Queensland. In this State it stretches from the Tweed River to the Cairns timber district. It is one of the most handsome of our native flowering trees, and is especially valuable as the flowers lend themselves so well to design. It belongs to the Silky Oak family (*Proteaceæ*) and has a silky-oak grain but paler than that timber.

Tie Bush.

W.T.M. (Nudgee)—

Your specimen is the Tie Bush (*Wickstroemia indica*), a plant with a very evil reputation in Queensland. Feeding experiments were carried out with it some years ago at the Animal Health Station, Yeerongpilly, but the animals experimented with (heifers), although very emaciated and passing bloody scours, recovered when put on to ordinary feed. A few years ago, however, specimens of the berries were received from Nambour with the report that they had fatally poisoned a child in the neighbourhood. Feeding experiments with the berries were conducted on guinea pigs, and proved that they were highly poisonous. We remember in the first experiment the plant was in flower only, so probably it is the berries that are the poisonous part of the plant. The eradication of the plant is certainly recommended.

Black Wattle. Quinine Berry.

J.D. (Chinchilla)—

The specimens represent—

1. *Acacia Cunninghamii*, the Broad-leaved Wattle or Black Wattle;
2. *Petalostigma quadriloculare*, Wild Quinine or Quinine Berry.

These two trees are very common over a very extensive range in Queensland, both on the coast and inland, and we never saw them eaten by stock—that is, in any quantity. One might see an occasional sucker of wattle eaten down. Neither of them are known to possess any harmful properties. Both, particularly the wattle, could be used as an emergency food.

Russell River Grass. Mat Grass.

A.O. (Peachester)—

The grass with the small dark seed heads is *Paspalum paniculatum* (Russell River Grass), widely spread over most tropical countries. It is very common in North Queensland, but is rarely seen down south. It was boomed a good many years ago as a fodder, particularly for dairy cattle, but has since gone quite out of favour. It has a very poor reputation in North Queensland, but it is very abundant in some parts, and during the season horses greedily eat the seed heads, and are said to do remarkably well on them, being just like corn-fed animals.

The other grass is *Axonopus compressus* (Narrow-leaved Carpet Grass or Mat Grass), a common tropical grass of some value on second-class country. It has a great disadvantage, however, of invading better class paspalum pastures, very much reducing their value for dairying purposes.

Waddy Wood.

C.J.G. (Mapleton)—

The specimen of wood represents *Trochocarpa laurina*, a small tree fairly common in coastal Queensland and with a wide distribution. The only local name we have heard applied to it is waddy wood. It is rather an anomalous member of the Australian heath family (*Epacridaceæ*), and we have never noticed the peculiar lime or citrus smell mentioned by you. It is quite distinct from *Backhousia citriodora*, though this latter probably grows in your district. We have seen it in moderate abundance at Candle Mountain, west of Beerwah, and in less abundance in coastal, sandy, rather thick forest towards Noosa. *Backhousia* also grows very often on the coast on rather muddy flats.

T.T. (Birkdale)—

Your specimen has been determined as *Capillipedium parviflorum*, (Scented Beard or Scented Top), a very common grass in forest country in Queensland. It is quite a good grazing grass.

Russian Thistle. Creeping Saltbush.

C.E.E. (Killarney)—

1. *Salsola Kali* (Russian Thistle), a species of Roly-Poly. Eaten by stock in the very young stages, but, generally speaking, rejected by them when older. When the plant is in seed, however, horses are very fond of the seed heads. We have no records of the effects of this plant on milk and cream.
2. *Atriplex semibaccata* (Saltweed or Creeping Saltbush), one of the best of the saltbushes. Very abundant on the Darling Downs and Western Queensland generally. We have had no experience of its effect on milk and cream, but think it would give it rather a strong weedy flavour.

We do not known if either of these plants would cause milk to ferment quickly.

Rib Grass. Crowsfoot Grass.

J.S. (Chinchilla)—

1. *Plantago lanceolata* ("Rib Grass"). Mostly found in Queensland as a weed of cultivation, or where the ground has been disturbed, rather than as a herb in the ordinary pasture. It is sometimes recommended for sowing in pasture mixtures. Personally, we have not seen stock eat it to any great extent.
2. *Eleusine indica* (Crowsfoot Grass). Not to be confused, of course, with the herbage called Crowsfoot that is very common on parts of the Darling Downs and in the Maranoa district. Analysis shows this grass to be very nutritious but, like young sorghums, it contains a prussic-acid-yielding glucoside, and if eaten in any quantity by hungry stock on an empty stomach trouble may ensue. Very little trouble has been experienced with the plant in Queensland, and, on the whole, ordinary paddock stock feed on it with impunity. It mostly occurs as a weed of cultivation or in places where the ground has been disturbed rather than as a grass of the ordinary pasture.

Broad-leaved Carpet Grass.

B. (Brisbane)—

The grass is *Axonopus compressus* (Broad-leaved Carpet Grass). This grass is common in most warm countries and occurs in Queensland in two forms—a narrow-leaved form and a broad-leaved form. The latter—the one you send—is generally regarded as the better of the two. It has quite a good value as a grass for second-class country, but has the disadvantage that it may invade paspalum pastures in scrub country, and almost ruin them from the point of view of a dairy pasture. In America this grass is spoken very highly of as a fodder, but our experience with it here is that it is of only very moderate quality.

Paspalum Urvillei.

W.J.C. (Childers)—

The specimen represents *Paspalum Urvillei.* This grass was boomed as a fodder some years ago under the name of *Paspalum virgatum,* but has now gone entirely out of favour. It is a native of South America, but is now quite common in some parts of Queensland, particularly on some of the second-class country along the North Coast Line between Brisbane and Gympie. So far as our experience goes, however, although it is a luscious-looking grass, stock do not take readily to it. In fact, we have heard of cases where almost starving cattle would hardly look at the grass. The class of country on which it grows, of course, might affect its feeding value, and it might be somewhat more palatable on your country than on the coast.

Grasses from Central Burnett Identified.

F.A.S. (Mundubbera)—

1. *Bothriochloa intermedia* (Forest blue grass).—In Central Queensland this is looked upon as an excellent fodder grass.
2. *Alloteropsis semiolata* (Cockatoo grass), with a few specimens of *Digitaria* sp.
3. *Panicum decompositum,* sometimes known as barley grass.
4. *Sporobolus elongatus* (Rat's tail grass).—An inferior species.
5. *Chloris divaricata.*—A native grass which has possibilities as a pasture grass, and also for lawns.
6. *Eriochloa* sp.—Most of the *Eriochloa* grasses are good fodder grasses.
7. *Aristida glumaris.*—A three-pronged or three-awned spear grass.
8. *Cymbopogon refractus* (Barbed-wire grass).
9. *Themeda australis* (Kangaroo grass).—Eaten by stock when young, but becomes rather coarse and unpalatable when mature.
10. *Dichanthium sericeum* (Blue grass).—A number of forms of this grass are found in Queensland. They are all excellent pasture grasses.
11. *Bothriochloa decipiens.*—Bitter or pitted blue grass or red leg. This is a very inferior grass which has considerably reduced the carrying capacity of some coastal pastures in Queensland and New South Wales.
12. *Eragrostis parviflora* (Weeping love grass).
13. *Rhynchelytrum repens* (Red Natal grass). Of little use for fodder, except when cut up and made into "chop-chop."
14. *Chloris ventricosa.*
15. *Capillipedium parviflorum* (Scented top or scented golden beard).—In the Rockhampton district this is looked upon as an excellent pasture grass.
16. *Arundinella nepalensis.*
17. *Aristida ramosa.*—A three-pronged or three-awned spear grass.
18. *Heteropogon contortus* (Bunch spear grass).—This is quite good fodder when young, but the sharp seeds are dangerous when the grass is mature.
19. *Imperata cylindrica,* var. *Koenigii* (Blady grass).
20. *Eragrostis cilianensis* (Stink grass).—Usually found as a weed of cultivation, along roadsides, &c. It is not usually looked upon as of any value, although working horses have been said to eat it.
21. *Setaria surgens.*
22. *Leersia hexandra* (Rice grass).
23. *Eragrostis* sp.—A species of love grass.

24. *Eragrostis leptostachya* (Paddock love grass). A useful grass in the average native mixed pasture.
25. *Tragus racemosus* (Small burr grass).—Regarded by sheepmen in the West as quite a good fodder, though the burrs are a nuisance in wool.
26. *Eleusine indica* (Crowsfoot grass), usually met with as a weed of cultivation, along roadsides, &c. Stock seem fond of it, and its food value is high. However, it contains a prussic-acid-yielding glucoside, and if eaten in quantity by hungry stock would probably cause trouble.
27. *Digitaria marginata* (Summer grass).—A weed of cultivation.
28. *Chloris virgata* (Feather top grass), also known as feather top Rhodes grass, a grass closely allied to Rhodes grass, but much inferior to it as a fodder. Stock seldom touch it, except when it is made into hay.
29. *Echinochloa colona* (Barnyard millet).—Usually found in damp situations, or as a weed of cultivation. It is closely allied to the cultivated fodders Japanese millet and white panicum, and should be quite a good fodder.
30. *Cyperus gracilis.*—A sedge, not a true grass.
31. *Cyperus iria.*—A sedge, not a true grass.
32. *Fimbristylis diphylla.*—A sedge, not a true grass.
33. *Fuirena glomerata.*—A sedge, not a true grass.
34. *Cyperus polystachyus.*—A sedge, not a true grass.
35. *Juncus communis.*—Not a grass, but a rush.
36. *Eriochloa* sp.
37. *Eragrostis Brownii* (Love grass).
38. *Cleistochloa* sp.
39. *Cleistochloa subjuncea.*
40. *Dichanthium sericeum* (Blue grass).—One of the best of our native grasses.
41. *Eulalia fulva* (Brown top grass).—Has a fairly good reputation as a fodder.
42. *Cymbopogon* sp.
43. *Stipa verticellata* (Cane grass or bamboo grass).—A coarse grass of little value as a fodder.
44. *Eriachne* sp.
45. *Eriachne* sp.

The genus *Eriachne* is under revision by Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, so that we cannot give you specific names for these.

46. *Schizachyrium obliqueberbis.*
47. *Eragrostis parviflora* (Weeping love grass).—A native grass about whose fodder value little is known. It should prove quite useful however.
48. *Pappophorum Lindleyanum.*
49. *Pappophorum nigricans* (White heads).—Not regarded as of much consequence from the point of view of pasture.
50. *Triraphis mollis.*—Common in sandy situations. Not regarded as a very good fodder.
51. *Perotis rara* (Comet grass).—A native grass common in sandy situations. It is not looked upon as of much value as a fodder.
52. *Digitaria Brownei.*
53. *Digitaria* sp.
54. *Digitaria* sp.
55. *Stenophyllus barbatus.*—A sedge, not a true grass.
56. *Fimbristylis vaginata.*—A sedge, not a true grass.
57. *Sorghum halepense* (Johnson grass).—A serious pest in cultivation. Its long underground rhizomes make it very difficult to eradicate.
58. *Echinochloa Walteri.*—A grass usually found in damp situations. It is closely allied to the cultivated fodders Japanese millet and white panicum, and should be quite good fodder.

Pigweed.

J.G. (Fernlees)—

Pigweed has several times been accused of poisoning stock in Queensland, but it is not known to possess any poisonous properties, and we think in all cases death can be attributed to bloat or hoven.

Identification of Grasses.

F.W. (Wandoan)—

We have no complete publication dealing with the grasses of Queensland. "The Grasses and Forage Plants of New South Wales," by E. Brakewell, price 6s. 6d. posted, obtainable from the Government Printer, Sydney, New South Wales, you may find useful. Although it deals principally with New South Wales grasses, most of those described in the book occur in Queensland. We would be pleased, however, to identify, and report on, any specimens of grasses or other plants you care to forward. Of grasses, a few seed-heads and a stalk, doubled up so as to be rolled comfortably in a small piece of newspaper, should be sufficient. When more than one specimen is sent, each specimen should be numbered and a duplicate retained, when names and reports corresponding to the numbers will be returned. If desirous of a quick reply, it is not advisable to send, say, more than ten specimens at one time.

General Notes.

Sugar Experiment Stations Acts.

All existing regulations under the Sugar Experiment Stations Acts have been rescinded, and new regulations, embodying many of the provisions of the old regulations, together with provision for meetings of the Sugar Experiment Stations Advisory Board and the conduct of business thereat have received executive approval.

Plywood and Veneer Board.

Notice of intention to extend the operations of the Plywood and Veneer Board for the period from 3rd May, 1935, to 2nd May, 1936, was published in the "Government Gazette" of the 19th January. No petition was received up to 15th February last on the question of the extension of the Board, and an Order in Council formally extending it for the period abovementioned has been issued. The Board applies to that portion of the State south of the twenty-third degree of south latitude.

QUEENSLAND SHOW DATES, 1935.

May.

Barcaldine, cancelled.
Kilkivan, 20 and 21.
Roma, 21 to 23.
Ipswich, 21 to 24.
Biggenden, 23 and 24.
Gympie, 24 and 25.
Toogoolawah, 24 and 25.
Dirranbandi, 24 and 25.
Kalbar, 25.
Maryborough, 28 to 30.
Biloela, 30 May to 1 June.

June.

Gin Gin, 1 to 3.
Marburg, 1 to 3.
Childers, 3 and 4.
Emerald, 5 and 6.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Warrillview, 8.
Boonah, 12 and 13.
Gladstone, 12 and 13.
Gayndah, 12 and 13.
Esk, 14 and 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Kilcoy, 11 and 12.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Nambour, 18 to 20. Campdraft.
Cairns, 23, 24, 25.
Atherton, 30 and 31.
Gatton, 31 July and 1 August.

August.

Gatton, 31 July and 1st August.
Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.
Home Hill, 30 and 31.

September.

Imbil, 6 and 7.
Esk Carnival and Campdraft, 6 and 7.
Pomona, 13 and 14.
Tully, 13 and 14.
Innisfail, 20 and 21.
Beenleigh, 20 and 21.
Rocklea, 14.
Kenilworth, 28.

October.

Malanda, 2 and 3.

Rural Topics.

Milk Distribution in New Zealand.

Discussing at the Southern District conference of the Agricultural Bureau of New South Wales some impressions of dairying in New Zealand gathered during a recent visit with a party of New South Wales farmers, the senior departmental dairy instructor located at Wagga gave some interesting facts concerning the Wellington municipal milk depot.

The central distributing plant, it was stated, was housed in a prominent brick building, the main dairy room being 195 by 98 feet and elaborately tiled in white. In this were the bottle-washing and bottling sections, surrounded by an elevated inspection gallery on which also were situated the milk-holding vats and pasteuriser. The milk was pumped to the chilled holding tanks from where it was fed to the pasteuriser and heated to 145 to 150 degrees Fahr., being held at that temperature in a special holding vat for thirty minutes. From there it gravitated over a brine cooler situated in a dust-proof room and then by gravity was fed to the bottling machines of which there were four, each pair capable of bottling 130 bottles per minute. Bottles were washed and sterilised in a machine capable of handling 8,000 bottles an hour.

The operatives, who changed into clean uniforms daily, had their own mess room, recreation room, and superannuation scheme.

The temperature of Wellington was rarely over 80 deg. Fahr., and deliveries were made in open carts, which were fed by motor lorries, under which system each man could deliver about 90 gallons daily.

The milk was subjected to rigorous tests for quality, and payment was made according to quality and fat content, and was based on one-quarter of London parity for butter, one-quarter of local price for butter, and one-half London parity for cheese. To this basic price was added a premium of about 2d. a gallon to cover the cost of licensing, upkeep, loss of by-products, &c. In the winter a premium of 85 per cent. of the summer price was paid. The average return to the farmers was approximately 11d. per gallon, while the average retail selling price was 1s. 10½d. per gallon. Second-grade milk was paid for at 1d. less than first grade and without premium. The average quantity graded down was about 5 per cent.; 5,000 gallons were treated daily, and a profit of some £7,000 a year was made.

A token system of payment was used with great success. Small metal tokens distributed by agencies were bought in numbers at a discount by householders, and these tokens were left out with the milk jug, thus eliminating bad debts.

Wellington had certainly set a standard in milk supply that was a model for any city.

Laying Out an Orchard—Contour Planting.

When laying out a new orchard on sloping ground serious consideration should be given to the prevention of soil erosion, and the plan which offers the best solution of this problem is to plant on the contour with a slight fall in one direction. When this is done the ploughing and cultivation can follow the contour, and each plough and cultivator track will act as a minature contour drain, thus, to a great extent, keeping the water spread—not allowing it to concentrate at any point. A slight bank can be thrown up along the line of trees, also acting as a contour drain of larger capacity.

And as an added precaution should an extraordinary downpour occur, a bigger bank at intervals is advocated—the frequency of these depending on the fall of the slope being planted. A wider space between the lines of trees would be necessary where these larger banks are located to allow for their formation.

Contour planting is quite suited to commercial orchards. It offers no difficulties to carrying out the ordinary orchard operations, except to a very slight extent when ploughing. The trees along the contour lines can be planted at the required regular distance, but the contour lines may not be parallel, so that when ploughing, the distance between the rows of trees will be slightly wider in some places than in others. An experienced ploughman would quite easily overcome this difficulty, and the slight inconvenience is insignificant when compared with the damage to the trees from the loss of soil.

As a matter of fact, on a fairly even slope it is possible, by modifying the grade of the contour lines to a slight extent and by some banking, to keep groups of lines of trees very little out of parallel.—A. and P. Notes, New South Wales Department of Agriculture.

Points in Dairy Practice.

Maize or sorghum silage is best fed to dairy cows with lucerne hay at the daily rate of 3 lb. silage and 1 lb. lucerne hay for each 100 lb. body weight of the cow. Concentrates may be added to the ration, a mixture being preferable to a single concentrate. Cracked or crushed grain, bran, pollard, linseed meal, and copra cake are suitable for this purpose.

A concentrate mixture may be fed according to the yield of the cow and the amount of pasture available. Under bad winter conditions, a full daily ration would be completed by adding to the silage and hay 1 lb. of a concentrate for each—

3 lb. of Jersey milk produced per day.
3½ lb. of Shorthorn milk produced per day.
4 lb. of Holstein milk produced per day.
1 lb. of butter-fat produced per week.

Thus a full ration for a Shorthorn cow weighing 1,100 lb. and producing 21 lb. of milk per day would be—

33 lb. silage.
11 lb. lucerne hay.
6 lb. concentrates.

At Hawkesbury Agricultural College it is found that the following make good mixtures:—

For Winter.	lb.
Maize silage	25
Green barley	25
Lucerne chaff	6
Cocoanut oil cake	2
Linseed meal	1½
Bran	3

If green barley is not available, 30 lb. of maize silage and 10 lb. of lucerne hay may be given—

For Summer.	lb.
Maize silage	25
Green maize	25
Lucerne hay	10
Bran	2
Linseed meal	2

Oaten and wheaten chaff can also be fed in conjunction with silage, but more concentrates should be used.

The average quantity of silage consumed per cow at the College during the winter months is 30 lb. per day.

The only care to be taken in feeding silage is not to overfeed bulls. The maximum amount that a bull should receive is 15 lb. a day.

Cows and Sheep—An Unusual Combination.

The Government Sheep and Wool Expert (New South Wales) is of opinion that fat lamb raising could be made a profitable sideline to dairying on some of the lighter undulating country on the North Coast (N.S.W.). He was referring in particular to the Wingham district, which he inspected quite recently. Anyone launching out in this sideline in that locality would be considerably advantaged by the fact that the Wingham bacon factory has facilities for killing and handling the carcasses, and consequently there would be no loss of weight or bloom.

A conservative estimate of returns per year from a flock of fifty ewes was as follows:—Wool (6½ lb. per head) at 10d. lb., £13 10s. 10d.; lambs, 40 at 15s. per head, £30, making a total of £43 10s. 10d. per year.

A certain amount of disease, particularly worms, would be experienced, and those running the sheep would have to be prepared to drench systematically.

The lambing would have to be arranged to take place at the best season of the year, when up to five months good feed conditions could be expected. Furthermore, the lambing must be restricted to a reasonably short period. This would mean keeping the rams away from the flock, except for, say, a two-months mating period. Only pure bred rams should be used.

Trees on the Farm.

Where trees are to be planted together, such as for windbreaks or avenues, the land should be first ploughed. New land should be broken up before winter and allowed to lie until planting time. A plan which has its advantages is to make the first ploughing only deep enough to cover the grass and herbage. Shortly before planting the ground should be cross-ploughed deeply, and then harrowed. Ground previously under crops would probably contain many weed seeds, and to enable the young trees to become established before the weed growth becomes unduly aggressive such land should be ploughed and harrowed, and planted immediately afterwards with the trees. Where hillside planting is being carried out, the ploughing should follow the contour of the hills as far as possible.

Ordinary hole planting is attended with some risks, especially where the subsoil is impervious. In such cases the hole tends to become merely a pool of stagnant water and a grave for tree life. Where trees must be planted in holes, such as in the case of isolated shade, shelter, and ornamental trees, the holes should be made as large as possible. A hole 3 feet by 3 feet and 2 feet deep is the smallest size allowable, and larger holes, where possible, should be made.

Where deep digging carries the hole into an impervious subsoil, it is better to make the hole wide and shallow, the depth not exceeding that of the soil. On wet, poorly-drained soil, ridges or mounds may be formed as sites for planting. Ploughing two adjoining furrows so as to throw the sods together achieves this end in a minor way. Irrespective of what method is adopted, the preparation of the land should be completed before stock for planting is obtained.

The best time for planting is when the plant is at its resting period, and when moist, cool conditions prevail. Generally speaking, May to August are the best months. The effects of frosts must be studied, and spring planting is often necessary in some localities, except for deciduous species. Where the rainfall is heavy and conditions generally are cool, the planting period may be considerably extended. A cool, cloudy day and a fairly moist soil provide ideal conditions.

Maize as Stock Feed.

It is extraordinary how often the disposal of the grain on the open market is regarded as the only source of income from maize. Its utility on the farm is not sufficiently realised. In the United States, the greatest maize-producing country in the world, over 85 per cent. of the crop is fed to live stock in some form or another, and growers constantly keep in mind the fact that live stock will probably be the ultimate market for the crop. The American maizegrower, therefore, is chiefly concerned in producing the highest number of pounds of live stock per acre at the least cost of human labour, and in the development of the maize industry in New South Wales, this will be a problem of first importance.

While conditions in the U.S.A., with its millions of population, may not be wholly comparable with our own, the fact remains that maize should be utilised much more extensively as feed for pigs and dairy cows, particularly the latter, to maintain the milk flow in winter months. A South Coast dairyman recently recorded an increase of 22½ per cent. in the quantity of milk produced by adding 2 lb. crushed maize per day to a ration of lucerne and silage, giving a market value to the maize of approximately 6s. per bushel.

Although in total food production per acre, and as a fattening agent maize has no superior, the grain is somewhat low in protein, and deficient in vitamin A, and it is necessary at all times to supplement rations with feeds which will make up for these deficiencies. This is readily available on the farm in some form of green fodder, leguminous for preference. Fortunately, the value of green maize as fodder is well known, and its conversion into ensilage is becoming every year more popular on coastal dairy farms.

For pig fattening maize is invaluable, and with pork selling at a reasonable figure the return per bushel is invariably better than the open market price for grain; for example, it has been estimated that with pork at 4½d. per lb., maize grain fed with other suitable feeds has a value of 4s. 2d. per bushel, on the basis of approximately 9 bushels of grain producing 100 lb. of pork.—"Agricultural Gazette" of New South Wales.

Evolution of Hornless Cattle.

In the *New Zealand Farmer* for April, Primrose McConnell discusses under the caption "How Breeds of Purebred Hornless Cattle are Bred Up from the Horned," a subject of great interest to Queensland stockowners. A farmer correspondent had written to him as follows:—"I have had an argument with a friend over the dehorning of cattle, and I shall be very glad to have your opinion on the matter through the columns of the *Farmer*. My friend maintains that if cattle are regularly dehorned, year after year, they will eventually become hornless, naturally. I feel sure that this is not correct, and we have its incorrectness well demonstrated in the docking of lambs, an operation that has been carried out for a great many years without any shortening of the newly-born lambs' tails. Will you also kindly state how the hornless breed of Shorthorns and Herefords were originated."

Primrose McConnell gave the following reply:—

"At a superficial glance these queries may not seem of great importance, but I am of the opinion that dehorning is of great value to all breeders and fatteners of cattle, and to the dairy farmer; hence, I am glad to take the chance of once more ventilating the matter.

"Origin of the Polled Shorthorn.

"It was natural that the breeding of hornless cattle from the horned should originate in the United States of America, because in the days when the Longhorn held almost complete possession of the American cattle ranches, and very long journeys by rail had to be undertaken to the meat packers, the damage done by horns was very great. The packers found a much higher percentage of loss in bruised meat on the carcasses of horned cattle, and they make a difference of from five to ten cents per 100 lb. in favour of polled cattle.

"At rare intervals a hornless calf is born in a horned herd, and such have proved to be very prepotent in imparting the hornless feature to their progeny. How these sudden variations come about has never been explained, but it is a fact that a hornless bull will nearly always produce hornless calves. There was, and may still be, a strain of hornless wild white cattle at Somerford Park in Cheshire, whose origin is unknown, but it has been kept pure for at least 250 years. There are other polled breeds in Britain: The polled Angus, the Black Galloway, and the Red Polls of Norfolk and Suffolk.

"The Polled Durhams (Shorthorns) originated in America about the year 1870, and they contained two strains: The Single Standard and the Double Standard. The Single Standard Polled Durhams are high-grade Shorthorns; the Double Standard Polled Durhams are purebred Shorthorns, but the Single Standard has almost gone out of existence. Both strains resemble very closely the purebred Shorthorns.

"The Polled Durham Association was established in 1889, with a membership of eight breeders. As far back as 1908 the membership had been increased to 2,200 breeders of Polled Durhams, and the membership goes on increasing. The breed was developed mainly in the States of Ohio, Indiana, Illinois, Iowa, and Minnesota.

"The history of the Single Standard strain is fully known. About 1870, several breeders, working independently, undertook to produce hornless Shorthorns by putting horned Shorthorn bulls on hornless or 'mulley' cows of unknown breeding. There is said to be no doubt that those cows were descended from polled European stock.

"The produce resulting from this cross were carefully selected, all bulls being sent to market, and the hornless heifers bred to horned Shorthorn bulls, which process was continued for four or five generations. Polled bulls of this high-grade stock were then used on the polled heifers for a generation or two, when Shorthorn bulls were again resorted to. The progress was slow, but the hornless characteristics proved very persistent, and by the year 1899 animals were required to carry 96 per cent. of Shorthorn blood to be eligible for registration.

"Apart from the injury that is often done with horns, hornless cattle thrive better than the horned, because they are more content, having lost the fear of their herd mates. The damage done to the carcasses of fat cattle in transit to the freezing works is well known, and it is not uncommon to see a fine carcass in the freezing works so badly damaged with horns that it is only fit for turning into manure.

"A strain of purebred hornless cattle cannot be developed by constant dehorning, just as a tailless sheep flock cannot be developed by constant docking; but, if a ram lamb were born minus a tail in a purebred tailed flock, the chances are that he would produce tailless lambs, but I have no record of this being tested.

"In 1905 a rule was passed requiring all animals to trace to recorded stock, thus closing the books and preventing the introduction of any more up-graded cattle. This development served to arouse general interest in hornless cattle, and paved the way for the development of the Double Standard strain.

"The rapid increase of the purebred Polled Shorthorns is due to the fact that the breeders had an unlimited field to draw upon for females. Purchases of cows and heifers were made from the very best Shorthorn herds, and breeders have a keen demand for their hornless bulls. There is no doubt that there is a great future before the breed, which is eligible for both the Polled Durham and Shorthorn Herd Book. So far as we in New Zealand are concerned, hornless breeds have become more precious since meat-chilling was perfected.

"THE POLLED HEREFORD.

"This breed originated in America since 1889. As in the case of the Polled Shorthorns, there are two strains: double and single standard. The pure hornless cattle, and are so-called because they are eligible for entry in both the Polled Hereford Herd Book and the American Hereford Herd Book. The Single Standard Polled Herefords are eligible for entry only in the Polled Hereford Herd Book.

"Mr. Guthrie, of Atchison, Kansas, discovered in the autumn of 1889 a polled bull calf with perfect Hereford markings. The dam was three-quarters Hereford and one-quarter Shorthorn in blood. The sire was one of two Hereford bulls which ran with the herd. These were Grateful 3rd and Treasurer. The calf was named Discovery, was a good type, and at three years of age, without special feeding, weighed 1,986 lb. By using this bull on horned Hereford cows, Mr. Guthrie secured a number of polled cattle of true Hereford type. It is stated that all the calves sired by Discovery from horned cows were polled. Some of the best individuals were bred together, and by 1898 a small herd of very high-grade Polled Herefords had been built up. From them work was started, looking to the production of Double Standard Polled Herefords.

"Another line of Single Standard Polled Herefords was established by crossing and up-grading by Mossom Boyd, of Bobcaygeon, Ontario, Canada. In 1893 he bred two purebred Angus bulls to five purebred Hereford cows each. Most of the nine calves resulting were black with white face, and polled. Only one calf was retained for use. This was a bull calf, black, with the white markings of a perfect Hereford type, and polled. Twenty-three calves resulted from the two years' breeding. Nine were black, with white faces, and more or less of other Hereford markings. Fourteen were red, with white face, and more or less of other Hereford markings. Five of the lot were retained—two bulls and three cows. All were red with perfect Hereford markings. One bull and the three cows were purchased by the Embar Ranch in Wyoming, and were used there for some years. The progeny retains the Hereford marking, and many of them are polled. They are simply high-grade hornless Herefords, and not as prepotent as purebreds, but are excellent as individuals.

"The Double Standard Polled Herefords, like the Double Standard Polled Durhams, owe their origin to 'sports.' In 1900, Warren Gammon and Sons, of Des Moines, Iowa, undertook to locate any Polled Herefords that might exist. They wrote to all the American Hereford breeders, and located fourteen animals that were minus horns, due to incomplete transmission of hereditary resemblance. About the same time Mossom Boyd purchased two polled bull sports, purebred and very prepotent dehorners. Development has come by breeding together the polled stock, and by using the polled bulls on Polled Hereford cows.

"The Polled Herefords have made great strides in recent years, and many of them are really very fine beef cattle—a number quite excellent for the chilled meat trade.

"Dehorning of the dairy herd is very easy by operating on the young calves with caustic potash, but on the runs where many beef cattle are bred dehorning them in this manner would be considerable trouble, and the best plan is to turn to the pure breeds that are naturally hornless, or to those that have been built up by judicious selection.

"A hornless breed of Milking Shorthorns could be produced by crossing the cows with a good bull from a milking strain of the Red Polls. This might affect the milk yield for a time, but some of the Red Polls are good milkers."

The Value of Reading—A Working Farmer's Thoughts.

In a paper read at a district farmers' conference, Mr. H. Queale, of the Boor's Plains (Yorke Peninsula) Branch of the South Australian Bureau of Agriculture, had this to say on the value of reading to the man on the land:—

Reading ranks with travel and intercourse with one's fellow men as a means of acquiring knowledge, and for the rank and file of farmers is the most accessible. The average farmer is blessed with a fair amount of commonsense, and has his own ideas about matters pertaining to his daily life. Left unexpressed, they are of small account. But passed on to his fellow men, the ideas become vitalised and of greater importance. Even the wrong idea is best expressed, because one is given the chance to help and correct his fellow man. Of infinitely greater importance is the good idea when it is passed on.

Many men cannot always evolve an expression from a thought. He is not good at telling the other fellow, with any marked degree of lucidity, what he has in mind. This applies in a peculiar manner to the man on the land, because he lives, to a point, unto himself. Resulting from this quasi-lone life is an embarrassment at hearing his own voice, with the consequent difficulty of expression. Herein lies the value of reading. The man who reads and takes notice of what he reads, unconsciously absorbs words, terms, phrases, and paraphrases, and modes of expression. These are stored away in his subconscious mind, and at the most unexpected times, very often, these expressions flash across his mind and help him out of a difficulty. He acquires an ease of manner and a freedom of speech from his reading which, without travel and intercourse, would be denied him. With a little reference to a good dictionary he will also acquire correct pronunciation and enunciation of the language of the day.

In his daily life he has the practical experience of his work, and if he couples this with studying suitable books he is undoubtedly the gainer. The bogey word "theory" would certainly lose a vast amount of valueless meaning to the conservative-thinking farmer, and he may become a Bureau member and a reader of the "Journal of Agriculture," the value of which is very great.

To accumulate knowledge and obtain ideas of current topics the constant use of the daily paper is unsurpassed. Reading widens one's outlook and extends the vision to realms of thought and feeling otherwise unattainable. Australia, by reason of its great distance from other countries, is apt to foster ideas of insularity. Although wireless and aerial progress have minimised distance, the man on the land, by his isolation, still labours under many disadvantages. Travel is too expensive to be indulged in extensively.

The desire for and value of co-operative thought and action have been evidenced times without number. The danger of thinking and acting alone threatens to become political retrogression and industrial stagnation. The value of reading to the man on the land cannot be too greatly stressed. For as he reads so he thinks, and as he thinks so does he act. The value of acting upon the result of co-operative thought brings its own reward.

As a pleasure and a hobby the book lover finds nothing so entrancing or enchanting as a good book. R. L. Stevenson's lines, "What are my books? My friends, my church, my tavern, and my wealth," readily come to one's mind. To-day the value of recreation to the man on the land has a definite place. It is a time of serious thought and grim struggle. Unless he spends his leisure hours—few enough though they be—in pleasant ways, his mind will not be refreshed when he again takes up his daily duties.

The choice of literature is of very great importance. There are many dangers as well as benefits to be had from reading. It is well worth a man's while studying carefully the works of the day before accepting all and sundry alike, and when Australia has a better informed farmer who has the ability to put his "case," then, and then only, will she have a rural population who can defend the man on the land and lend a dignity to his calling.

Reading is one of the surest, safest, and most accessible means of acquiring a sense of expression, a knowledge of matters requiring understanding, and a real and lasting pleasure to the man on the land.

Australia's Great Trees.

In Volume LI., No. 11, the March issue of the "Victorian Naturalist," Mr. A. D. Hardy has written a most informative article on "Australia's Great Trees." He says that so many reported excessive heights of Australian trees half a century ago were found, on official investigation, to be exaggerations; that in recent years, when eucalypts 300 feet in height had become rare, all records of such exceedingly tall trees met with incredulity or were quoted with much caution by responsible writers. On the other hand, reckless or misinformed persons have shown little hesitation in reviving and perpetuating erroneous figures, which then have been repeated in British and foreign publications. In these prints it is not always obvious that what is recently quoted as for living trees is really based on information in old and discarded records of trees that have long since vanished, or that a statement in some recent number of a periodical has been corrected or withdrawn in the following number. Reliable figures can be quoted to-day for the height of existing tall trees. They have been carefully measured by officials, and the results officially recorded. In Victoria the largest trees are found in the Central South divisions of the State, in the Dandenong Ranges, the South Gippsland Ranges, the Great Dividing Range, and the Otway Ranges. In 1896, in the Cumberland Valley, Mr. D. Ingle, then a local forester (later one of the Forest Commissioners of Victoria) directed attention to a tree which measured 301½ feet. A belt of trees in the Cumberland River or Tyers River Valley covering an acre of ground was cleared of undergrowth to admit of the measurement of the tree. The total number of trees was twenty-seven. Height measured with Abney level (or clinometer) average 266 feet; tallest of the group, 293 feet; girth at 10 feet—average, 13.5 feet; largest girth, 17 feet 4 inches. The Monda tree on the southern slope of the Great Dividing Range measures to the forked and broken top 287 feet by Abney level measurement. This big tree must have been over 300 feet. Now it shows signs of decay, and recent storms have reduced its height still further. In the Otway region there is a tall mountain ash forest approximating 300 feet; Forests Commission clinometer measurements making several over 290 feet.

Odd Jobs for the Orchardist.

This period of the year is frequently regarded by many orchardists as being the most convenient in which to undertake the many odd jobs that accumulate during the busier periods. To delay too long in carrying out such needed work as overhaul of fencing and gates, painting and repairs to machinery, &c., results in much quicker depreciation, and finally the much heavier expense of replacement long before it would have otherwise been found necessary.

Protection of the woodwork and iron roofs of buildings by painting, or even by coating the woodwork with preserving oil, is a job that is not always attended to as frequently as it might be. Consideration should also be given to the desirability of painting the wooden portions, and some of the metal parts as well, of farm machinery.

This is also a good time of the year to attend to repairs to ploughs, cultivators, spray pumps, and the rest of the working plant. There is little time to do these jobs while the season's work is in full swing. Furthermore, to have the machinery and plant in the best working order means both greater efficiency and economy of operation.

Similarly, a thorough overhaul of the packing shed and its equipment at the present time is well worth while.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

Rickets in Queensland.

THE other day one of our Baby Clinics was visited by a healthy woman with a healthy breast-fed baby a few months old. There was nothing wrong with either of them; but the mother was anxious, because she had been told by a doctor that her two older children were suffering from rickets. We asked to see these older children. Their father, who was waiting outside, brought in a boy aged four and a little girl not yet two years old. The boy was big for his age and apparently well-nourished, but had had knock-knees. He will probably need two operations and prolonged treatment to straighten his legs. The little girl had bad bow-legs. She may be cured without operation, but will also need prolonged treatment.

Rickets and Diet.

Here was a lamentable fact; two healthy parents with two deformed children, who should have been perfectly straight and healthy. The parents were well-intentioned and affectionate, and the condition of their children was not due to poverty. It was due entirely to want of knowledge. Rickets is an easily preventable disease, and should never occur in Queensland. It is a condition in which the young growing bones are ill-developed. In extreme cases their growing ends are visibly enlarged and their development is slow. In less severe cases the bones grow, but they are soft, the leg bones gradually bend with the child's weight, and the straightening of them is no easy matter. Unfortunately, in Queensland this latter condition is not rare. Rickets occurs only in children whose diet is defective. For the making of bone three things are necessary—lime, phosphate, and vitamin D. Without the vitamin, lime, however abundant in the diet, cannot be absorbed, and is consequently useless. All three are present in cow's milk, and good milk taken in sufficient quantity is an absolute preventative. A partial deficiency in the supply of milk may be compensated by cod liver oil. When healthy breast-fed babies are weaned at nine to twelve months, their diet should consist mainly of cow's milk and they should be given at least one pint daily. Failing this, rickets may be expected. According to Dr. Harvey Sutton no less than 25 per cent., that is one in four, of the children entering school in New South Wales show definite evidence of mild rickets. If the children are poorly nourished and grow slowly, softening of the bones may be slight. If, however, they are healthy in other respects and grow fast, the softening is worse, for the rapidly growing bones of these children need a larger supply of lime, phosphate, and vitamin D. Together with bad bones these children develop faulty teeth.

Rickets is not merely a disease of the bones and teeth. Want of the vitamin causes a defective supply of lime to the whole body, and lime is a necessity to all living tissue. Rickety children suffer from unstable nervous systems, and easily go into convulsions. They are retarded mentally just as much as bodily. Indeed the mental inferiority may be more important than the physical. All deficiency diseases affect the nerve tissues. This is true of scurvy, it is evident in the neuritis of beri-beri, and the dreadful results of pellagra. We need to realise the importance of an adequate vitamin-rich diet for the growth of a healthy, stable, active mind.

Rickets and Sunlight.

We depend mainly on our diet for a sufficient supply of vitamin D, but it may also be obtained from the effects of sunlight on the human skin. The little brown and black babies, who sprawl in the sunshine, never suffer from rickets. In Australia the sun gives us this vitamin for nothing—nothing at all. Unfortunately, our babies and toddlers are kept out of the sun, or so covered with clothing, that the sun's gift is of no use to us. Certainly care is needed in protecting their heads and eyes, and in gradually exposing their skins to the sun's rays, for otherwise they may suffer from sunburn. For this there are rules with which our clinic nurses are familiar.

One fine warm afternoon lately I paid a visit to a lady whose two small children were playing happily on the grass in very scanty bathing suits. Their mother explained that their skins had been gradually hardened to sunlight from babyhood, and they had never had sunburn. How much happier our children might be, if other mothers did the same! Social custom may compel us to over-clothe our children in the streets, but surely in our own gardens and backyards bathing costumes are as healthy for them as on the sea beaches.

IN THE FARM KITCHEN.

Pickles.

On a commercial scale cauliflowers, cucumbers, and onions are held for long periods in brine, and a large proportion of the pickles purchased in the stores are prepared from such brined vegetables. They are put down in large barrels or tanks and covered with a brine containing approximately 1 lb. of salt per gallon of water. The salt draws water and carbohydrates from the tissues of the vegetables and also toughens them somewhat. It also prevents the growth of many kinds of bacteria, but certain types which produce lactic acid can tolerate salt, and these organisms slowly ferment the carbohydrates. This is known as the curing process, and cured vegetables have a darker colour than the fresh ones. Cucumbers change from a bright green to a deep olive green colour, and the flesh becomes more transparent. Cured vegetables are seldom used until they have been brined from six to twelve months. In making pickles in the home this long brining is unnecessary. The vegetables are generally covered with salt or placed in a brine for only one or two days. The salt or brine withdraws some of the water from the vegetables and makes them more crisp.

General Method for Home Pickling.

In pickling, as in any other methods of preservation, it is important that the vegetables should be in a thoroughly fresh condition. After the preliminary preparation, such as removing outer leaves of cabbage or cauliflower and cutting the larger vegetables into suitable pieces, the vegetables should be either placed in a brine made from 1 lb. salt and 1 gallon water or sprinkled liberally with salt and

left from 12 to 48 hours. If the vegetables are placed in brine they should be kept under the liquid as much as possible by weighing them down. If dry salt is used the vegetables should be placed in a large porcelain basin in layers, with a good sprinkling of salt between each layer. The time necessary for soaking in brine is given in the recipes at the end of the chapter. The vegetables should be removed from the brine and rinsed thoroughly in cold water to remove traces of salt. They should then be allowed to drain to remove as much water as possible and packed into clean jars to within 1 inch of the top. If any water has settled at the bottom of the jar during packing it should be drained off before the jars are filled with vinegar. Sufficient cold, spiced vinegar should be poured over the vegetables to cover them completely; in fact, there should be a layer of vinegar on top of the vegetables of at least ½-inch. During storage there is a certain amount of evaporation of the vinegar, and if the vegetables are not well covered with vinegar at the outset the vegetables at the top of the jar are left uncovered after some weeks and become very badly discoloured. When the vinegar has been poured over, the jars should be sealed as tightly as possible. If metal caps are used, care should be taken to see that the vinegar does not come into contact with the metal.

Vinegar.

The best vinegar should be used for pickling, and it should have an acetic acid content of about 5 per cent. White vinegar gives a better appearance to the pickles, but malt vinegar is preferable because it gives the pickles a better flavour. Spices are generally added to the vingar before it is poured over the vegetables. To make spiced vinegar, the following ingredients should be added to each quart of vinegar:—

¼ oz. cinnamon bark
¼ oz. cloves
¼ oz. mace
¼ oz. whole allspice
A few peppercorns or a pinch of cayenne pepper.

The spices tied in a muslin bag should be added to the vinegar and brought just to boiling point. It is important to have the lid on the saucepan during this process, otherwise much of the flavour is lost. The vinegar should then be removed from the stove and allowed to stand for two hours. The spice bag should be removed, and the vinegar is ready for use. There is a certain amount of controversy as to whether the vinegar should be used hot or cold, but experience has shown that cold vinegar gives the better result when pickling vegetables such as cabbage, onion, &c., which should be crisp when ready to eat, while hot vinegar proves better for the softer type of pickles such as walnuts, plums, &c.

RECIPES.

Pickled Cauliflower.

Sound cauliflower should be selected and the outer leaves removed. The flowers should be broken into small pieces, washed thoroughly in salt and water, placed in a large basin, and covered with brine made from 1 lb. salt to 1 gallon of water. and allowed to stand for 24 hours. They should then be rinsed in cold water, drained thoroughly, and placed in bottles or jars. The spiced vinegar should be poured over, and the bottles sealed with corks or tied down with a piece of bladder.

Pickled Onions.

Small, even-sized onions should be selected and placed with their skins on in a brine made from 1 lb. salt to 1 gallon water. They should be left for 12 hours, and then peeled, laid in a fresh brine, and left for 24 or 36 hours. They should then be removed from the brine, washed thoroughly in cold water, and allowed to drain thoroughly. The onions should then be filled into jars or bottles, covered with cold spiced vinegar, and kept for three or four months before being used.

Pickled Red Cabbage.

The cabbages should be firm and of a good colour. They should be washed and any discoloured outer leaves removed, and the cabbage cut into shreds. The shreds should be placed in a large basin, each layer being sprinkled with salt, left for 24 hours, the shreds allowed to drain thoroughly, and then packed into jars or bottles and covered with cold spiced vinegar.

Pickled Beetroot.

The beets should be washed, care being taken not to break the skin. They should be placed in boiling salted water, and simmered gently for 1½ hours. When cold, they should be peeled and sliced into rounds ¼-inch thick, packed into bottles, and covered with cold spiced vinegar. They should not be used for at least a week.

Pickled Gherkins.

The gherkins should be placed in a brine made from 1 lb. salt to 1 gallon of water, left for three days, drained well, and packed into jars. Hot spiced vinegar should then be poured over them, and they should be covered tightly and left for 24 hours in a warm place. The vinegar should be drained off, boiled up, and poured over the gherkins, which should be covered tightly, and left for another 24 hours, this process being repeated until the gherkins are a good green. After the final process, a little more vinegar should be added if necessary, and the jars corked and stored.

Pickled Vegetable Marrow.

2 lb. marrow (after peeling)
4 oz. sugar
¼ oz. ground ginger
¾ oz. mustard
¼ oz. curry powder
6 peppercorns
3 gills vinegar.

The marrow should be cut up, sprinkled with salt, and allowed to stand overnight. The other ingredients should be added to the vinegar, boiled for five minutes, and then the marrow added and cooked until tender. The pickle should be packed into jars and sealed.

Pickled Green Tomatoes.

5 lb. green tomatoes
1 lb. small onions
1 lb. Demerara sugar
1 quart spiced vinegar.

The tomatoes and onions should be sliced, sprinkled with salt, left overnight, and drained thoroughly. The sugar and vinegar should be boiled, the tomatoes and onions added and cooked until tender. They should then be put into jars and sealed.

Mixed Pickle.

Cauliflowers, onions, cucumbers, and French beans may be put up as a mixed pickle. If small cucumbers can be obtained they are preferable. The vegetables should be cut into suitable sized pieces, salt sprinkled over them, and allowed to stand for 48 hours. They should then be washed, drained thoroughly, packed into bottles, the vegetables being arranged neatly, covered with spiced vinegar, and sealed.

Pickled Damsons or Pears.

7 lb. fruit
4 lb. sugar
3 pints vinegar
½ oz. whole cloves
½ oz. allspice
1 piece ginger root
1 stick cinnamon
The rind of half a lemon.

Damsons should be washed and stalked; pears should be peeled, cored, and cut into eighths or quarters according to the size of the pears. The sugar should be dissolved in the vinegar, the spices crushed, tied loosely in a muslin bag and added to the vinegar. The fruit should be simmered in the spiced, sweetened vinegar until quite tender. Then the liquid should be drained from the fruit, which should be packed neatly into jars. The vinegar should be boiled gently until slightly thick, and each jar filled with enough hot vinegar syrup to cover the fruit. The pickle should be tied down with bladder, or corked securely. It is better if it is kept some months before being used.

IN THE FARM GARDEN.

Green Manure in the Vegetable Garden.

Where it is intended to commence the cultivation of vegetables during the spring this is the most important time of the year to make the preliminary preparations. As advised in earlier issues the laying out of the ground, digging and trenching are important operations which may be undertaken now. Green manuring is a most important and useful practice for bringing soil into good condition for sowing and planting in the spring, when almost any variety of vegetable may be grown. Green manuring offers a ready means of increasing the organic matter in the soil, and also of adding to the soil fertility. It is also the most useful means of suppressing weed growth and cleaning land for future cropping. It is generally recognised that legume-bearing plants are the most useful for green manuring. Field peas are very largely used. When plants belonging to the legume-bearing family are grown under suitable conditions, and the roots are attacked by bacteria in the soil which produce nodules upon the roots of the peas, the plants are capable of absorbing a considerable amount of nitrogen from the air, and thus the soil is enriched by this valuable plant food which is expensive to purchase in manures. But unless the nodule-forming bacteria are present in the soil the legume-bearing plants will draw from the soil the nitrogen they require for their growth, and the soil will be no richer in this element for their use.

If the land has not grown peas successfully before, it will pay to take a bushel or two of soil from a garden patch or field where peas have thrived, and sprinkle a small quantity of this soil along the drills where the peas are being sown. Another very useful legume for green manuring is the tick or horse bean. This plant resembles the broad bean, but the seeds are much smaller and are not used as a vegetable. The main object of a green manure crop is to obtain as much organic matter as possible for digging into the soil in the early spring. In this regard the horse bean is more valuable than the field pea. If it is necessary to inoculate land with nodule-forming bacteria for this crop, soil should be taken from a garden patch where broad beans have been grown successfully. There are different species of organism which produce nodules upon the roots of legume plants, and the bacteria which produce the nodules on the roots of peas will not similarly act upon the roots of beans. For general purposes a crop of Algerian oats or Cape barley is very satisfactory as a green manure crop. These cereals may be depended upon to give a good strong growth, providing ample bulk for digging into the soil. They also have the advantage that, not being related to any of the plants commonly grown in the garden, they are not subject to diseases which may be transferred to the vegetable crops to be grown later on. When sowing green-manure crops superphosphate should be used with the crop at the rate of 1½ to 2 oz. to the square yard. The use of the fertilizers will produce a greater bulk of green manure, and where the crop is dug into the ground the phosphates which have been absorbed by the crop will be liberated in the soil as the plants decay, and be made available in time for other plants to use.—"The Australasian."

Nitrogen for the Garden.

The most important and at the same time the most expensive element of plant food in garden soils is nitrogen. It is obtained in various forms, and the pea and clover family have the power of absorbing and assimilating to their own use the nitrogen of the atmosphere. It is for this reason that nitrogenous manures should not be applied, except in extreme cases, to beans or culinary or sweet peas. The four principal nitrogenous manures are sulphate of ammonia, nitrate of soda, nitrate of lime, and calcium cyanide of nitrolim. All are highly concentrated, and need to be used with the utmost care.

Nitrogen always stimulates the development of stem and foliage at the expense of flower and fruit or seed. If after excessive wet, or from some other cause, a plant appears to stand still, a small dose of nitrogenous manure will often stimulate it, and have a wonderful effect. On the other hand, a dose of a nitrogenous manure given when the plants are in flower or seed will often cause them to shed their flowers and fruit or seeds by causing an exuberance of growth of a soft, sappy nature.—"New Zealand Farmer."

Kitchen Garden.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

A Reminder to Onion Growers.

Onion seed growers should, by this, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

The Farm Vegetable Garden.

The question of drainage should be considered in relation to all classes of soil, but especially in relation to those that are at all heavy. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months. Now is the time to think of the question of treatment.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil, and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess quantities of water to be carried away with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upwards from this. In other cases it may only be necessary to feed the main trench from one side, while in others again main trenches may best to laid at the edges of the area and fed from the centre. These trenches may then be partially filled with broken stones, and the surface of the filling protected with a layer of tin or brushwood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones, if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

The depth at which the drain should lie will depend upon the class of soil, but, needless to say, it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 ft. 6 in. to 3 ft. is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on land of a heavier character should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.—A. and P. Notes, N.S.W. Department of Agriculture.

Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

Orchard Notes for June.

THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured

fruit, owing to the absence of fruit-fly punctures, as there is always a percentage of damaged fruit which is liable to blue mould infection, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year; consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit-fly, and are a menace to the district. Now is the time to get rid of them. If such

trees are old and worn-out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now where the land is ready and the trees are to hand, as early-planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be prunded now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyards ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress; otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whreas if cut and ased now they will keep in good order so that they can be used during the hot weather.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

In Memoriam.

F. F. COLEMAN.

We regret to record the passing at the age of sixty-six years of Mr. F. F. Coleman, Officer in Charge of the Pure Seeds, Stock Foods, Fertilizers, Pest Destroyers, and Veterinary Medicines Branch of the Department of Agriculture and Stock, which occurred on 24th April.

The late Mr. Coleman was born in Sandwich, England, and received his early education in England and France. Later, he specialised in the study of seeds and plant life and took out an extension course under the auspices of the Cambridge University. In 1903 he obtained an award of merit from the Royal Horticultural Society, London. He was afterwards engaged in the supervision of extensive variety trials, and the inspection and selection of crops for seed purposes in both England and France. Interested in military matters, he joined the British Volunteer Garrison Artillery. After coming to Australia he entered the Queensland Department of Agriculture and Stock in December, 1914, in the capacity of seed expert, and organised the Queensland seed testing station. To the work of the station, other activities were added from time to time. He made grasses his hobby, and pasture improvement was added to the more important activities of his branch. He planned a comprehensive series of experiments, which he developed indefatigably. He was the first secretary of the Pasture Improvement Committee, through which experiments on a larger scale was possible. He was a capable administrator, maintaining a high standard of efficiency in his branch. In legislation governing pure seeds, fertilizers, stock foods, and pest destroyers, Queensland is regarded as a pioneer, and in his administration of the several Acts of Parliament respecting those agricultural essentials, and veterinary medicines also, Mr. Coleman did good work for the man on the land, whose interests within the scope of the activities of his branch he was assiduous in protecting. In some of those measures he had a shaping hand, assisting in the drafting of them with an eye to their effective application when passed into law. Method, thoroughness, and dependability characterised all his work, never losing sight of the practical end in view.

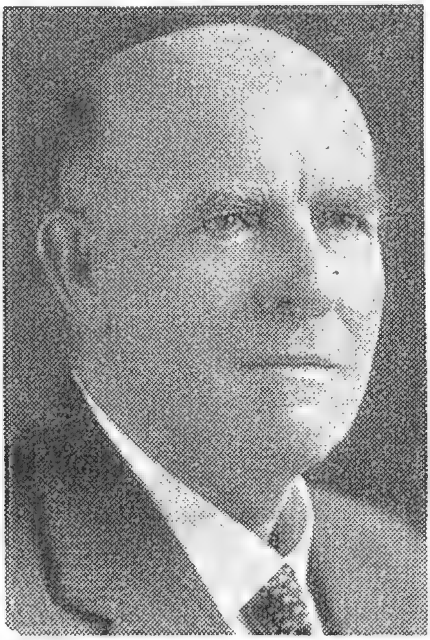
He was a frequent contributor to the "Queensland Agricultural Journal" on technical subjects, and among his recent contributions were "Pasture Improvement," "Intensive Pasture Improvement," "Subdivision, Renovation, and Top Dressing to Produce Better Grass," "The Cultivation of Grasses," "Some Factors that Determine the Keeping Qualities of Stored Maize," and "Wild White Clover," and "Comparative Analyses of Grasses, Clovers, and Other Fodder Crops."

The late Mr. Coleman's first wife died in 1932. Later he married Miss L. Brundritt, who survives him; also two sons, Messrs. Bert and Leslie Coleman. His second son, Lieut. E. L. Coleman, was killed in action in France while serving with the Australian Field Artillery (A.I.F.). The interment took place at the Lutwyche Cemetery in the presence of many of his former colleagues and representatives of the commercial life of the city. The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) was represented by the Under Secretary and Director of Marketing (Mr. E. Graham). To the late Mr. Coleman's sorrowing relatives our deep sympathy is extended.

In Memoriam.

J. F. McCAFFREY.

After a short illness, the Registrar of the University (Mr. J. F. McCaffrey), passed away on 4th April, at the Mater Misericordiae Private Hospital. His death came as a shock to all sections of the University, as well as to the general community, where he was loved as a man, and esteemed as an administrator.



The late Mr. McCaffrey would have attained his fifty-third birthday on 25th November this year. He was born at St. Lucia and received his primary education at what is now known as the Ironside State School, winning an open scholarship under the head teachership of Mr. J. Loney, to the Christian Brothers' College, Gregory terrace. It is a significant fact that his nom-de-plume in one section of the scholarship examination was "Industry," a word which has virtually been his motto through life, and which is in some measure responsible for his comparatively early demise.

Having won his scholarship, he passed the New South Wales junior public examination, and the qualifying examination, entitling him to entry into the Queensland Public Service, in 1898. He was given some banking experience in the State Savings Bank before being transferred to the Harbours and Rivers Department. In 1904, he was transferred to the Department of Public Instruction. It was here that the young man began to show the sterling qualities as an administrator and organiser.

His industry and his organising ability soon brought him under the notice of Mr. J. D. Story, I.S.O., who was then Under Secretary, and Mr. McCaffrey was seconded for duty to the University of Queensland on its foundation in 1910 as chief clerk and accountant. Mr. Story had been very much involved in the early work of the University organisation, and he chose Mr. McCaffrey for his industry and his administrative ability to fulfil this important post in the early history of the institution. His services were first made available to the Senate in April, 1910, and soon afterwards he resigned his position with the Queensland Public Service, and in October, 1910, assumed to full responsibility of his new post at the University.

As chief clerk his advice was invaluable. He was secretary also to the Administrative and Finance Committees of the University. When in 1925 Dr. F. W. S. Cumbrae Stewart was appointed to the Garrick Professorship of Law Mr. McCaffrey was his logical successor to the post of Registrar.

How well he has filled this post during the past ten years no one but those most closely associated with him fully realise. He was an ideal Registrar, combining a rare business acumen with a most kindly heart. He met the students on the friendliest possible footing. Indeed, many a graduate to-day can thank the tolerance and help of Mr. McCaffrey which made it possible for him to finish his degree course. He was the

perfect link between the undergraduate body, the Senate, and the University staff, all of whom loved him as a man and respected him as an administrator. His loss to the University is beyond compute, not only for his personal qualities but also because of the manner in which he had centralised every administrative aspect of University activity. He worked like a slave in the service of the University, never sparing himself. It is a tragic coincidence that he passes on the eve of the University's celebration of its twenty-fifth birthday. Actually in January Mr. McCaffrey completed twenty-five years of service with the University. Keenly interested in land industries, the late Mr. McCaffrey assisted in the organisation of the Council of Agriculture, for which for a term he acted as secretary. The Faculty of Agriculture also claimed his close interest, and rural economics had in him an earnest student. He assisted in founding the St. Lucia Farm Boys' School, which is situated on University property.

He leaves a widow and one son and one daughter to whom deep sympathy is extended.

When the Chancellor (Sir James Blair) heard the sad news he was deeply affected. He said that Mr. McCaffrey had been a highly efficient and painstaking officer who had displayed great capacity for work and much enthusiasm in his efforts on behalf of education and the University. He was ever ready to offer sympathetic and sound advice to the students, by whom he was greatly beloved. Mr. McCaffrey was tactful and courteous in his dealings with people, and was trusted and respected by the members of the Senate and the staff. He would be remembered kindly and gratefully by all those with whom he came in contact—privately or officially.

On behalf of the Senate and himself, said the Chancellor, he would like to extend to Mrs. McCaffrey, her son and daughter, and relatives, an expression of deepest sympathy.

WALTER HIGHET.

Mr. Walter Highet, one of the senior slaughtering inspectors of the Department of Agriculture and Stock, died with tragic suddenness while on duty at the Cannon Hill Saleyards on Thursday, 4th April. For two days previously, Mr. Highet had been slightly ill, but did not worry much about it. At the saleyards he complained that he was not feeling well, and returned from the yards to his office. There while making out a stock permit he collapsed and died soon after the arrival of a doctor who had been summoned immediately.

Mr. Highet, who was known widely and esteemed highly in stock circles, was born in Garlieston, Scotland, sixty-three years ago, and came to Queensland at the age of twenty. He went to Western Queensland for colonial experience, and was engaged in the pastoral industry, with cattle mainly, for a considerable time. This experience, added to veterinary knowledge gained in Scotland, qualified him for appointment to the Department of Agriculture and Stock. He was appointed subsequently a slaughtering inspector, a position which he had held for nearly forty years. On Friday, 5th April, he was laid to rest at the Lutwyche Cemetery in the presence of a large assembly representative of the stock industry and the business life of the city, and which included many old departmental colleagues. The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) was represented by the Under Secretary and Director of Marketing (Mr. E. Graham).

The late Mr. Highet is survived by his widow and two sons (Messrs. J. S. and R. Highet), two daughters (Mrs. W. A. Lovegrove and Miss B. Highet), and two grandsons, all of Brisbane; and to them the deepest sympathy is extended.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	March.	No. of Years' Records.	March. 1935.	March. 1934.
North Coast.	In.		In.	In.
Atherton	8·48	34	16·56	14·36
Cairns	17·89	53	34·36	19·11
Cardwell	15·51	63	16·97	8·87
Cooktown	14·94	59	34·57	9·81
Herberton	7·62	49	11·24	12·80
Ingham	15·34	43	17·79	8·49
Innisfail	25·99	54	46·46	32·38
Mossman Mill ..	17·07	21	28·74	27·16
Townsville	7·19	64	2·78	0·85
Central Coast.				
Ayr	6·36	48	3·10	0·22
Bowen	5·49	64	2·62	1·62
Charters Towers ..	3·68	53	1·35	0·59
Mackay	11·73	64	5·20	6·47
Proserpine	11·71	32	2·60	10·33
St. Lawrence ..	5·15	64	2·62	0·46
South Coast.				
Biggenden	3·69	36	1·66	0·95
Bundaberg	4·97	52	1·11	1·85
Brisbane	5·59	84	1·06	0·82
Caboolture	7·48	48	2·21	4·30
Childers	4·36	40	1·14	1·35
Crohamhurst ..	11·05	41	4·42	4·79
Esk	4·64	48	1·88	0·78
Gayndah	2·99	64	1·41	0·65
Gympie	6·05	65	2·57	2·38
Kilkivan	3·79	56	0·60	0·41
Maryborough ..	5·83	64	1·52	2·53
Nambour	8·97	39	4·65	3·97
Nanango	3·33	53	..	0·54
Rockhampton ..	4·34	64	1·49	0·23
Woodford	7·71	48	1·96	3·40

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	March.	No. of Years' Records.	March. 1935.	March. 1934.
Central Highlands.	In.		In.	In.
Clermont	3·00	64	1·15	0·03
Gindie	2·55	35	0·05	0·07
Springsure ..	2·87	66	0·48	..
Darling Downs.				
Dalby	2·63	65	0·16	0·01
Emu Vale ..	2·28	39	0·55	..
Hermitage ..	2·10	28	0·40	..
Jimbour	2·47	47	0·62	..
Miles	2·60	50	0·46	0·05
Stanthorpe	2·59	62	0·19	1·03
Toowoomba ..	3·67	63	0·80	0·23
Warwick	2·45	70	0·49	..
Maranoa.				
Roma	2·53	61	..	0·23
State Farms, &c.				
Bungeworgorai ..	1·51	20	..	0·40
Gatton College ..	3·08	35	4.09	0·32
Kairi	7·43	20	..	16·90
Mackay Sugar Experiment Station	10·57	37	3·78	5·30

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MARCH, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·79	85	71	91	16	68	24, 25, 26	3457	16
Herberton	..	80	63	90	15	55	24, 25	1124	12
Rockhampton	29·94	88	68	101	15	59	17	149	10
Brisbane	30·02	82	65	91	23	55	17	106	10
Darling Downs.									
Dalby	29.98	86	58	98	15	46	18	16	1
Stanthorpe	..	79	52	90	22	34	18	19	7
Toowoomba	..	79	59	90	23	48	17, 18	80	4
Mid-Interior.									
Georgetown	29·81	92	71	97	11, 13, 15, 28	65	9, 10, 30	475	9
Longreach	29·88	97	69	108	14	56	17	17	1
Mitchell	29·96	90	62	102	14	48	17, 18	13	1
Western.									
Burketown	29·80	92	76	100	26	72	30	333	9
Boulia	29·81	98	72	109	14	60	17, 18	..	..
Thargomindah	29·93	92	64	106	14, 21	54	16, 18	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May. 1935.		June. 1935.		MOONRISE. May., 1935.	MOONRISE. June. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·18	5·20	6·37	5·1	4·11	6·16
2	6·18	5·19	6·37	5·1	5·17	7·15
3	6·19	5·18	6·38	5·1	6·22	8·10
4	6·20	5·17	6·38	5·1	7·27	8·59
5	6·20	5·17	6·39	5·1	8·29	9·40
6	6·21	5·16	6·39	5·1	9·27	10·16
7	6·21	5·15	6·39	5·1	10·19	10·49
8	6·22	5·14	6·40	5·2	11·5	11·16
9	6·23	5·14	6·40	5·2	11·45	11·48
					p.m.	p.m.
10	6·23	5·13	6·40	5·2	12·20	12·17
11	6·24	5·12	6·41	5·2	12·51	12·47
12	6·24	5·11	6·41	5·2	1·19	1·19
13	6·25	5·11	6·41	5·2	1·48	1·54
14	6·26	5·10	6·42	5·2	2·17	2·34
15	6·26	5·10	6·42	5·1	2·9	3·23
16	6·27	5·9	6·42	5·1	3·22	4·18
17	6·27	5·9	6·43	5·1	3·59	5·20
18	6·28	5·8	6·43	5·1	4·43	6·26
19	6·29	5·8	6·43	5·1	5·37	7·35
20	6·29	5 7	6·44	5·1	6·33	8·44
21	6·30	5·7	6·44	5·1	7·35	9·48
22	6·30	5·6	6·44	5·2	8·38	10·52
23	6·31	5·6	6·44	5·2	9·45	11·55
24	6·32	5·5	6·44	5·2	10·51	a.m.
25	6·33	5·5	6·45	5·2	11·55	12·56
26	6·33	5·4	6·45	5·3	a.m.	2·0
27	6·34	5·4	6·45	5·3	12·58	3·4
28	6·34	5·3	6·45	5·3	2·0	4·6
29	6·35	5·3	6·45	5·4	3·2	5·5
30	6·35	5·2	6·45	5·4	4.7	6·1
31	6·36	5·2			5·14	

Phases of the Moon, Occultations, &c.

3 May	●	New Moon	7 36 a.m.
10 ,,	☾	First Quarter	9 54 p.m.
18 ,,	○	Full Moon	7 57 p.m.
25 ,,	☽	Last Quarter	7 44 p.m.

Apogee, 12th May, at 12.18 a.m.
Perigee, 26th May, at 2.30 a.m.

Mars, which on 2nd February, was 5 degrees north of S,ica, and on 4th March had advanced to a little north-east of it, apparently turned backwards till on 18th May it will have receded 18 degrees. It will then apparently change its course, and resume a normal eastward direction. A loop will thus be formed in the constellation Virgo, and Mars will be found a useful beacon to point out that constellation. Spica represents the left hand of the Virgin, which is holding an ear of corn; it is also remarkable as one of the two stars of the first magnitude on the elliptic; this year the Sun will pass 2 degrees north of it on 16th October. Spica will reach the Meridian about half-past nine p.m. on 18th May.

The nearness of the full Moon to Antares, the principal star of the Scorpion, will be noticeable early in the evening of the 19th, but an occultation of the star will occur only in the northern hemisphere. The Moon will rise at Warwick at 5.37 p.m.

Mercury, on the 26th, though not nearly at its greatest brilliancy, will be fairly discernable, being nearly 23 degrees above the horizon when the Sun sets. It will be apparently amongst the small stars where Taurus and Gemini meet.

Mercury, quite invisible, will set 13 minutes after the Sun on the 1st; on the 15th it sets at 6.14 p.m., 1 hour 4 minutes after the Sun.

Venus sets at 7.33 p.m., 2 hours 31 minutes after the Sun, on the 1st; on the 15th it sets at 7.48 p.m., 2 hours 38 minutes after the Sun.

Mars rises at 3.50 p.m. and sets at 3.54 a.m. on the 1st; on the 15th it rises at 2.46 p.m., and sets at 2.52 a.m.

Jupiter rises at 5.53 p.m. and sets at 7.9 a.m. on the 1st; on the 15th it rises at 4.53 p.m., and sets at 6.3 a.m.

Saturn rises at 1.39 a.m. and sets at 2.23 p.m. on the 1st; on the 15th it rises at 12.49 a.m., and sets at 1.31 p.m.

The Cross will be upright at its highest position, XII., on the southern Meridian at 10 p.m. on the 1st, and 9 p.m. on the 16th, to an observer at Brisbane, where the Cross will be 57½ degrees above the horizon; at Townsville the elevation will be 49 degrees, and the time 24 minutes later.

1 June	●	New Moon	5 52 p.m.
9 ,,	☾	First Quarter	3 49 p.m.
17 ,,	○	Full Moon	6 20 a.m.
24 ,,	☽	Last Quarter	12 21 a.m.

Apogee, 8th June, at 7.12 p.m.
Perigee, 21st June, at 6.6 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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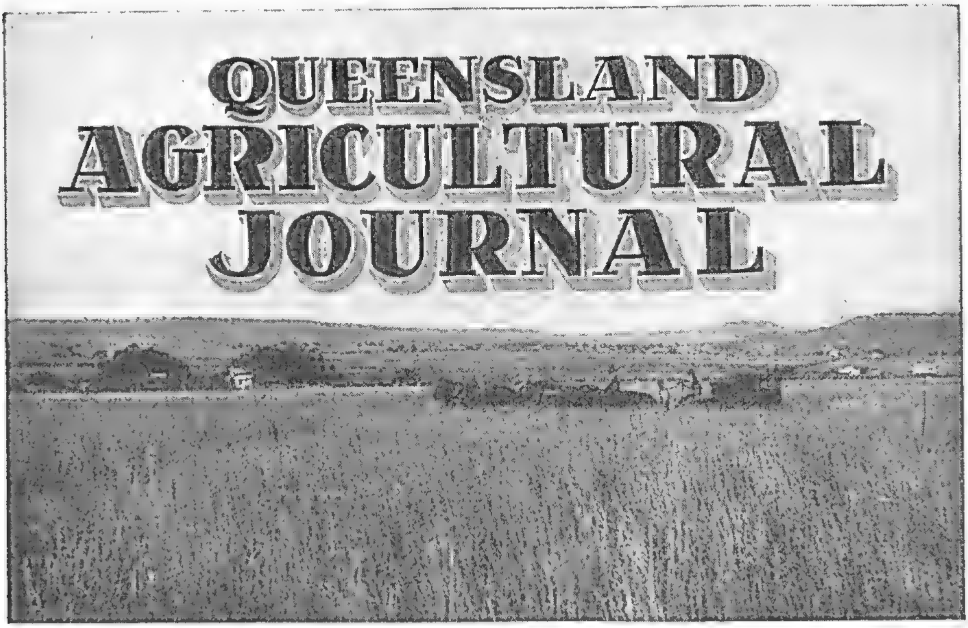


VOL. XLIII. 1 JUNE, 1935. PART 6

Event and Comment.

The King's Jubilee.

THE most noteworthy event of the month was the Commemoration of the King's Jubilee throughout the British Dominions. Describing the King as the father of his people, the Archbishop of Canterbury expressed the sentiments of the whole Empire when, at the historic gathering in St. Paul's Cathedral on 6th of May, he said:—

> The Empire has become a fellowship of self-governing peoples; yet their freedom has not lessened, but strengthened, their loyalty to the one Commonwealth. It is in one Throne that they find the symbol and bond of their unity.
>
> It may be that by mere force of cirucumstances or sentiment the Throne itself would have been accepted by the people of this realm, and the nations of the Empire, as the centre of their unity. What is certain is that the personality of the King has given to the Throne the power of personal attachment. He brought the Throne into the hearts of his subjects. They have discovered in the Sovereign a man whom they could understand, respect, and trust. They have seen in him a quiet dignity worthy of his high office, and with it an unaffected friendliness. They have seen his constant care for their welfare, and his unselfish devotion in their service.

The King's Message.

Responding to the messages of congratulations conveyed to him by radio by the representatives of the British Dominions and the Crown Colonies, His Majesty the King broadcast the following message to the Empire:—

> At the close of this memorable day I must speak to my people everywhere. Yet, how can I express what is in my heart? As I passed this morning through such multitudes to St. Paul's Cathedral, and as I thought of all that these twenty-five years have brought to me and my country and my Empire, how could I fail to be most deeply moved? Words cannot express my thoughts and feelings, I can only say to you: My very dear people, the Queen and I thank you from the depths of our hearts for all the loyalty—and may I say, love—with which this day and always you have surrounded us. I dedicate myself to your service for the years which may still come to me.
>
> I look back over the past with thankfulness to God. My people and I have come through great trials and difficulties together. They are not over. In the midst of this day's rejoicings I grieve to think that there are numbers of our people who are still without work. We owe to them, and not least to those who are suffering from any form of disablement, all the sympathy and help that we can give. I hope that during this Jubilee all who can will do their utmost to find them work and bring them hope.
>
> It is to the young that our future belongs. I trust that through the fund inaugurated by my dear son, the Prince of Wales, to commemorate this year many of them throughout this country may be helped in body, mind, and character to become useful citizens.
>
> To the children I would like to send a special message. Let me say this to each of them whom my words may reach:—
>
> The King is speaking to you. I ask you to remember that in the days to come you will be citizens of a great Empire. As you grow always keep this thought before you, and, when the time comes, be ready and proud to give your country all your services.
>
> I have been greatly moved by all the greetings which have come to me to-day from all my Dominions and Colonies, from India and from this, my home country. My heart goes out to all who may be listening to me now, wherever you may be—here at home, in town or village, or in some far off corner of the Empire, or it may be on the high seas.
>
> Other anxieties may be in store, but I am persuaded that with God's help they may all be overcome if we meet them with confidence, courage, and unity. So I look forward to the future with faith and hope.
>
> Let me end my words to you with those which Queen Victoria used after her Diamond Jubilee thirty-eight years ago. No words could more truly or simply express my deep feelings now: "From my heart I thank my beloved people. May God bless them."

The Farmers' S.O.S. Save Our Soil.

EROSION takes twenty times as much plant food from the soil as the hungriest crop. Between 1923 and 1933, 30,000,000 acres of agricultural land were destroyed by soil erosion, and ultimately abandoned in the United States. Within forty years, 90 per cent. of cultivable soil has been washed away in parts of British East Africa. In one region—Ukamba—the country is now a land of stark ridges of bare rock. The increasing native population obtains sustenance with the greatest difficulty. In drought years the natives have to be fed by the Government to keep them from starvation.

In 1920 the Union Government of South Africa appointed a Commission to inquire into the best means of avoiding drought losses, largely on the assumption that South Africa was gradually undergoing general dessication. After careful inquiry the Commission concluded that there was little evidence of change of climate, but that since the beginning of European settlement enormous tracts of country had been more or less denuded of the original vegetation, with the result that rivers and waterholes recorded by old travellers had dried up, disappeared, or only occasionally carried water. The consequent prospect was stated in this very alarming way:—"The simple unadorned truth," says the Commission's report, "is sufficiently terrifying without the assistance of rhetoric. The logical outcome of it all is the Great South African Desert, uninhabitable by man." The report goes on to say: "The quantity of rainfall shows little variation; its utility has certainly diminished, for the quantity absorbed by the soil is continuously decreasing, and for this man is responsible."

These impressive phenomena are, of course, not confined to America or Africa, and are common to every continent. Even Europe has its striking examples of the destruction of fertile territory, so essential to the maintenance of man.

The classic example of the Nile, with the joyful "Gyppo" reclining like the little lady in "Floradora" in the shade of the sheltering palm, watching the noble river working for him may, of course, be quoted; but there is, in fact, no comparison of the leisurely Nile with swifter flowing streams. The Nile's annual rise is extraordinarily gradual, and, to a great extent, the inundation of Lower Egypt is now well under control. There is no rush of silt or *débris* over the farming lands.

The causes of erosion are various, but the primary and most important cause is the wide-spread destruction of forests and other soil-binding or soil-retaining vegetation. In Queensland, every farmer on our coastal river catchment areas, as well as every producer in our back country, can see in his own neighbourhood what damage to both agricultural and grazing country unchecked soil erosion can do—damage hitherto quite unnoticed until, in many cases, the land has been robbed of its natural fertility by sheet erosion, or so gullied as to be useless, not only for cultivation but for grazing also. It is no exaggeration to say that in Australia almost every acre of sloping farming land, and much that is out of cultivation, in the higher rainfall zones is being affected by soil erosion.

In Australia generally, through the action of wind and water, depreciation and destruction of land has become definitely a serious national problem demanding immediate attention. Only in recent years has any notice been taken of it, and only then by those to whom the obvious facts have become apparent. So serious is the problem, and so disastrous are its effects, that the cry "Save our Soil" may well be regarded as agriculture's imperative "S.O.S."

The Control of Rats and Mice.

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

THE ravages of rats and mice in foodstuffs and their breeding and feeding habits are sufficiently well known to warrant dispensing with a discussion of these aspects of the rodent problem. Consideration of the pests may therefore be confined to the presentation of the main facts relative to their control. It is understood that these notes deal specially with the control of rats and mice in, or in the vicinity of, farm and other buildings.

Exclusion.

Firstly, emphasis must be laid on the desirability of rat-proofing certain classes of buildings by ensuring the elimination of all points at which the rats and mice can gain access. This involves a thorough examination of the buildings to locate such openings and their elimination by concrete, sheeting, wire gauze, or other suitable material. Such measures involving the rat-proofing of buildings are economically practicable in the case of large city produce and food warehouses and country storage depôts, and the saving resulting from the elimination or reduction of losses arising therein from attack by rats and mice justifies the expenditure involved. The rat-proofing of farm buildings is, however, quite a different proposition and cannot generally be accomplished at a cost that would be justifiable; hence, consideration in such cases must be given to the destruction of rats and mice by trapping, poisoning, or fumigation.

Trapping.

Trapping of both rats and mice is of considerable value in rodent control, experience indicating that the simple wooden spring trap produces just as satisfactory or even better results than much more elaborate and correspondingly costly devices. Mice are readily caught if the traps are placed close to the spots frequented by them. The bait may consist of bread, apples, raisins, cheese, or almost any other foodstuff. Rats are not so easily trapped, and success may not be achieved against them unless the traps are left unset, but baited, each day for a few days. They may then be once more rebaited, but this time they should be set, and, the rats' suspicions having thus been allayed, success may be achieved. Baits should, of course, be renewed each day, and in doing so and in handling rat traps generally the wearing of cotton gloves has been recommended.

Poisoning.

Should trapping fail to exercise a reasonable degree of control of the infestation, poisoning will have to be resorted to in order to clean up the rodent population. Experience indicates that the most satisfactory poisons to employ for the control of rats and mice are red squill and barium carbonate. The former is now much in favour, largely because it is the safest effective material to employ for such poisoning campaigns. The latter is also a favourite, chiefly because it is a somewhat inexpensive material, it is comparatively safe so far as human beings are concerned, and it is effective. It should, however, be handled with discretion, and precautions must be taken to ensure that it does not contaminate human or domestic animals' food.

Red squill will produce good results in a campaign for the elimination of rats and mice, but its successful use is dependent on attention

to certain details in the preparation and application of the baiting material. The first detail to which attention must be given is the provision of an adequate supply of bait to the rats and mice so that they may, if practicable, be eliminated by a single application of the material. The next point is that several types of bait should be laid in order to cater for the varying tastes of individual rats. A further important point is that as far as practicable no food other than the bait should be available to the rats and mice on the evening on which the bait is laid. Furthermore, the bait should be freshly prepared and applied in the late afternoon in small quantities about the size of a marble, particular attention being paid to the places where the rats and mice usually feed. Uneaten bait should be collected and destroyed.

Should some rats or mice survive the procedure just outlined, it will be necessary to repeat the treatment about three weeks later if a complete clean-up is desired. Baiting material is prepared according to the usual formulæ, except that the red squill is omitted. The bait is laid several times at two-day intervals, uneaten bait being collected and destroyed each morning. This procedure allays the suspicions of the rats and mice, and when these have been overcome red squill is once more included in the baiting mixture. It is well to emphasise the fact that although red squill is the safest poison to use for the control of rats and mice, it should not be handled carelessly. Most other animals, however, will either refuse to eat material containing red squill, or if they do they will soon vomit the bait.

Barium carbonate bait may also be employed in farm buildings with successful results. It is, however, poisonous to human beings and also to domestic animals, and in general preference should be given to red squill bait.

Fumigation.

Fumigation is frequently employed for the control of rats and mice, but it cannot be recommended for rodent destruction on the farm.

Bait Formulæ.

Red squill can be obtained either as a powder or as a liquid, such substances as fish, steak, bran, and oatmeal being employed in the preparation of the bait. A commonly employed bait is obtained by mixing 1 oz. of powdered red squill with sufficient water to produce a thin paste, which is added to, and well mixed with, 1 lb. of fresh, finely chopped-up meat. Another formula is one part of dry powdered red squill to ten parts by weight of oatmeal, minced meat, or minced fish, the ingredients being thoroughly mixed before distribution as bait. A third form of bait is obtained by cutting ½ lb. of bread into ½-in. cubes and mixing it with a pint of liquid red squill.

Barium carbonate is generally used in the form of a biscuit prepared by mixing one part by weight of barium carbonate with three parts of flour. These ingredients are mixed together, sufficient water being added to enable a stiff dough to be prepared. This dough is then rolled out to a thickness of ¼ in. and is cut up into pieces ½ in. in diameter. Finally, these small biscuits are dried in the sun or in an oven and are then ready for use.

The Pinhole Borer of North Queensland Cabinet Woods.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

Continued from page 451, May Journal.

LIFE HISTORY.

DURING the summer months, and frequently at intervals in the winter if weather conditions are mild, adults of *C. grevilleæ* are abundantly distributed through the rain-forest; hence, when a tree is felled during the flight-active period of the day, numerous adults alight on the log or tree, doubtless attracted by the chemotropic stimulus liberated from cut or injured wood surfaces. At first males dominate the infestation and commence to initiate burrows on exposed wood surfaces; thus, presuming that the logs have been cut and lie in the original position of the bole, infestation may take place at the sawn ends, at the sides where bark has been stripped off or otherwise injured, and at the fork of the tree if fractures have exposed wood tissue. The bark is not normally penetrated. Most of the burrows on an exposed wood surface are excavated immediately, though minor supplementary infestation may occur for a week or thereabouts.

The burrow is sufficiently deep to conceal the male in a few hours. Once inside the wood, further excavation alternates with periodic backward movements by which débris is thrust through the outer opening until the burrow has been carried approximately half an inch into the wood. By this time females are common on the surface of the log and the sexes become associated in the one burrow in unusual circumstances. The female passes from burrow opening to burrow opening until she locates a suitable burrow tenanted by the male only. She waits there patiently until he makes one of his periodic visits to the mouth of the burrow with surplus débris, and then, by dint of caresses in which both forelimbs and head appendages are used, coaxes him from the burrow, often after repeated failures. The female then enters the empty burrow and is immediately followed by the male. The subsequent extension of the burrow system is now a function of the female, the accumulated débris being thrust outside the log by the male.

Mating has not been observed, but, as eggs may be laid while the burrow system is still a single undifferentiated tunnel, fertilization must be effected in the first instance outside the log. Eggs may, however, be laid by the parent female at various points in the burrow system over a period of some twelve months; hence it must be presumed that the initial mating ensures fecundity for that period or that further matings occur in the log as the burrow system is elaborated.

Eggs may occur singly or in groups wherever the burrow lies in a horizontal plane, but they are commonly found in special arms of the burrow system more or less isolated from the main thoroughfares. The reproductive capacity of the species must be considerable, for some hundreds of immature forms may be distributed through the one burrow system. Exact estimates are, however, impracticable, as the linkage of burrow systems initiated independently is apparently common when infestation is heavy.

Eggs hatch during the summer within one month, and larvæ subsequently collaborate with the female in extending the burrow system. Development requires twelve months, and by that time burrows have been carried well into the heartwood of the log. The whole of the wood tissue is thus exploited by a network of burrows in a plane at right angles to the length of the log. Eggs and larvæ of all ages are then distributed through the burrow system.

Prior to pupation, mature larvæ congregate in branch burrows and excavate pupal chambers, which are grouped in typical Platypodid fashion. The chambers in any one group lie on both sides of the burrow in the one plane. The chambers are thus parallel to the length of the log and follow the grain of the wood. Chambers on opposite sides of the burrow usually alternate—a phenomenon which may be due to contemporary chamber excavation by the larvæ. The chamber dimensions correspond with the size of the enclosed insect, being normally 4 mm. in length, though there is some variation with the sex of the occupant, female pupal chambers being rather longer than those of the smaller male.

When transformation within the pupal chamber is complete, the adults break through the sealed mouth and re-enter the main channels of the burrow system. They ultimately escape from the log either through the outer surface or fissures leading to the outside. In any case, the insects do not use the original opening made by the parents and blocked by the body of the male, but construct independent exits. A number of these may be seen in any advanced burrow system, and it appears that several emerging adults share the one exit burrow.

In all probability, only a single generation occurs in the log. The offspring of the original parents require some two years for the completion of development, allowing egg-laying for twelve months and a further twelve months for larval growth. If *C. grevilleæ* remains in a log for more than two years, the phenomenon can best be explained by delayed initial infestation rather than presumed multiple generations in the log.

Behaviour on the Log.

Though adult insects wander at random over the surface of the log, the subsequent disposition of the burrows is not uniform, and suggests preferences of some significance to the insect. In one observational log concentric rings of the bark, 1 ft. across, were removed to expose the underlying sapwood. When infestation was complete, the burrow mouths were counted and their location noted. A typical example is portrayed diagrammatically (Plate 183, figs. 1 and 2), and indicates quite clearly that the maximum infestation occurs on the latero-dorsal surface, and diminishes towards both the top and bottom of the log.

In experimental material, split and sawn surfaces in different parts of the log were exposed to infestation and log sections were placed in many different positions for observational purposes. The incidence of infestation on these sheds some light on the behaviour of the species, and significant points are—

(*a*) Where a bark edge impinges on sapwood, the burrows tend to be concentrated in the 2 or 3 in. of sapwood adjoining the bark. Their distribution is illustrated diagrammatically (Plate 183, figs. 3 and 4).

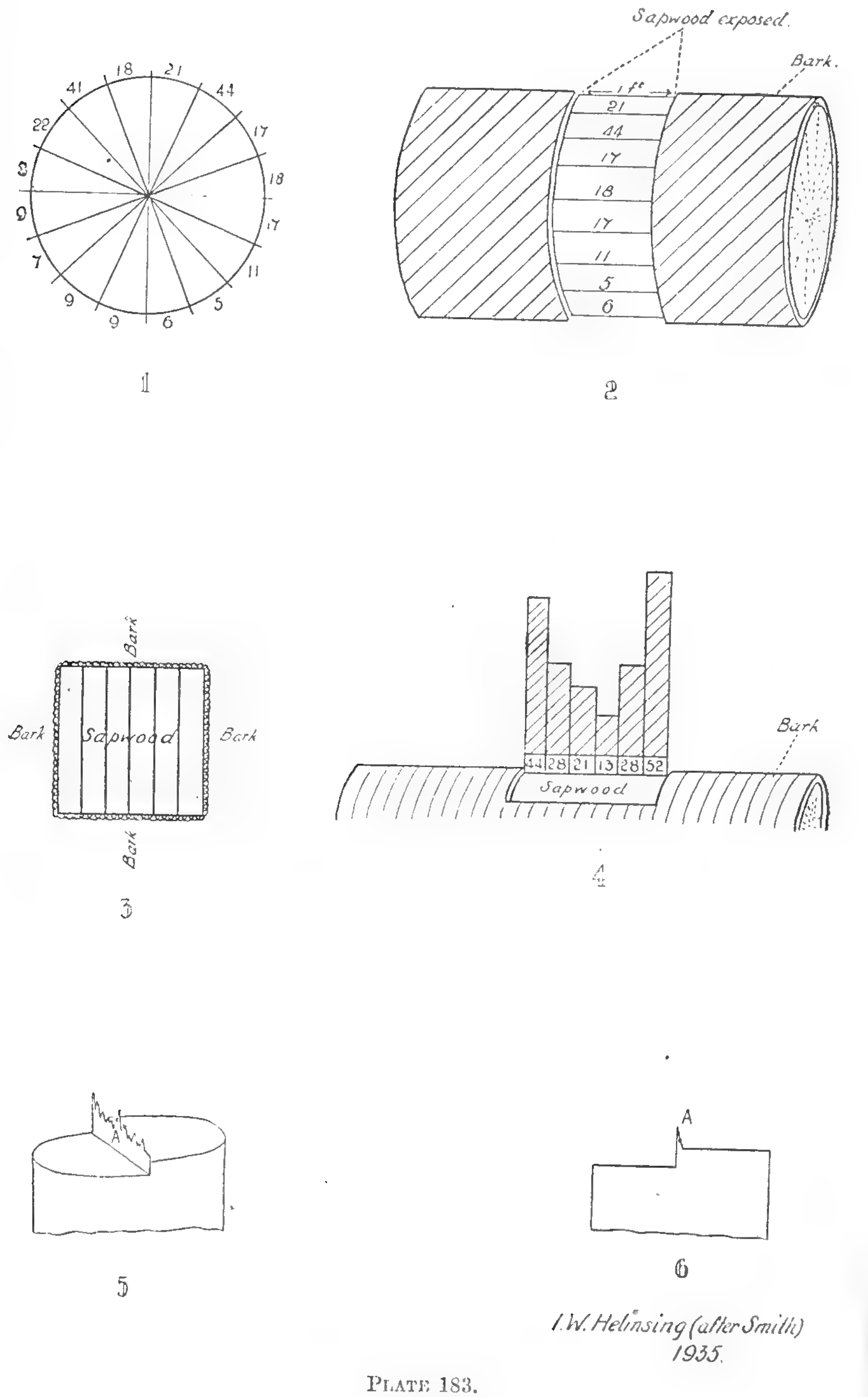


PLATE 183.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Fig. 1—Diagram showing infestation round log. Each sector 9 in. by 12 in. Fig. 2—Diagram showing position of exposed sapwood and varying intensity of infestation on side of log. Fig. 3—Diagram of 1 square foot of exposed sapwood on upper side of log. Burrow concentration at bark-sapwood edges thereon shown in Fig. 4. Fig. 4—Diagram of burrow density in 2-in. strips showing concentration of infestation at bark-sapwood edges. Fig. 5—Splintwood on tree stump (semi-lateral view). Fig. 6—Splintwood on tree stump (lateral view).

(b) During felling, two horizontal cuts are made with a crosscut saw on opposite sides of the tree. The tree frequently collapses before these independent cuts meet, and between the two a certain amount of fracturing takes place. Splintwood at the fracture normally suffers heavier infestation than the rest of the exposed surface of the tree stump. The position of such splintwood is indicated in Plate 183, figs. 5 and 6.

(c) Infestation on a horizontal surface is usually slight; thus, the upper surface of the tree stump escapes with comparatively light attacks, while barked surfaces at its side are burrowed into freely.

If *C. grevilleæ* were unaffected by outside influences, a randomised infestation of susceptible surfaces would be expected, but these examples suggest that some factor or factors induce variable attacks. The pedal disability of the insect apparently has some importance in this connection. Both sexes find it difficult to retain a foothold on wood surfaces facing the ground; hence they readily fall from the log should their movements be obstructed by burrow débris. Burrow initiation presupposes a firm grip of the log surface—a condition better satisfied on the upper than the lower side of the log. Pedal disabilities would thus stimulate burrow initiation on the upper surfaces of the log or stump. Were it otherwise, the under surface of the log would be the obvious place for the adults to initiate burrows, as that region is less subject to extreme solar influences than other parts of the log.

A second factor of some importance is undoubtedly thermal. On a flat exposed surface solar influences are evenly distributed, while on the rounded surface of a log temperatures reach their maximum at the top, diminishing along the sides to a minimum below. Ordinarily the inception of new burrows in the open is restricted to a few hours before and after noon. When log-surface temperatures are very high, the adults show a great deal of distress and are almost incapable of initiating burrows. It seems clear, then, that extremes of heat on the upper surface of a log will tend to force would-be burrowing insects to the sides. An example is afforded by the stumps of trees felled under conditions suitable for infestation. Few burrows are then initiated in the upper surface, while susceptible wood elsewhere suffers severely. The effective burrowing period on any log surface, if controlled solely by temperature, would thus be least on the top of the log and greatest below.

The actual concentration of burrows on the latero-dorsal surface thus seems to be a compromise between the two main limiting influences —pedal disability and surface log temperature, the former inhibiting burrow initiation below, the latter above, the log. Pedal disability is, however, a permanent influence and contrasts with thermal limitations, which operate only during the hotter parts of the day.

From the examples cited it seems that the distribution of burrows on exposed sapwood represents an attempt to reconcile various influences tending to inhibit burrow formation. The concentration of burrows on the latero-dorsal surface is apparent only when the bark has been removed from the tree or the log either completely or in strips. Should the insect population be considerable and the area of exposed sapwood limited, heavy infestation is practicable regardless of its position. The distribution of burrows from log to log may thus vary with the incidence of the pest and the position and amount of exposed sapwood.

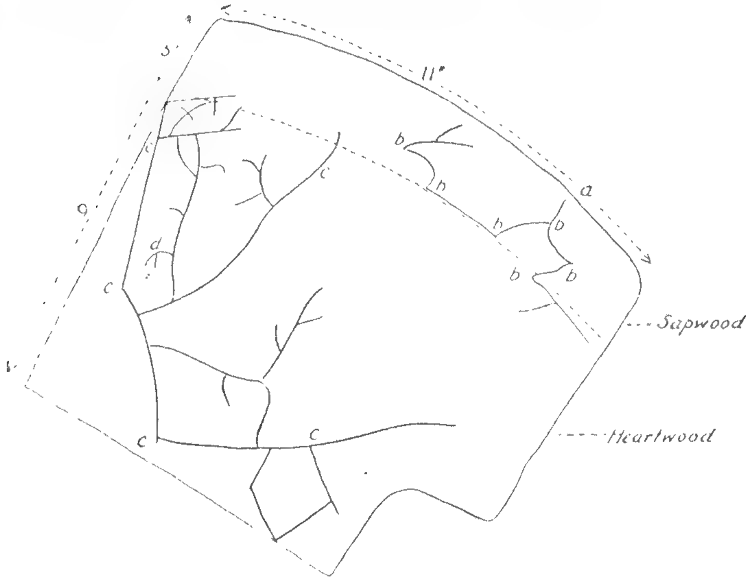
The urge to burrow is so evident in the male that, given suitable wood surfaces, excavation begins immediately. The preference for perpendicularly placed splintwood is probably due to the partial elimination of disturbing solar influences which normally operate on horizontally exposed surfaces, together with the added chemotropic attraction associated with ruptured wood tissue.

The aggregation of burrow openings on sapwood surfaces near a bark edge is rather striking, though the stimulus causing it is somewhat conjectural. Possibly the greater incidence of infestation is due to the increased chemotropic attraction associated with centres of sap exudation. At a bark edge the main conducting tissue of the plant is severed, and a heavy fluid exudate is discharged in limited quantities from the injury. If, as seems probable, the adults respond readily to chemotropic influences, the concentration of burrows in the neighbourhood of the discharge would be expected to conform with the example illustrated in Plate 183, figs. 3 and 4.

The Burrow System.

The burrow system of *C. grevilleæ* has the same essential pattern in all logs or tree residues examined. Should the insect enter exposed sapwood on the side of the log, the burrow is carried directly into the wood for 1 or 2 in., and then tends to become more intricate. Some main leaders pass straight into the heartwood, while subsidiary branches cut across themselves and link the main leaders until the whole cross-section of the log has been exploited. The burrow system normally lies in a plane which cuts across the grain of the wood; hence a cross cut often discloses its main features. Plate 184, figs. 1 and 2, displays the essential features of two burrow systems examined. Long, sweeping tunnels pass straight into the centre of the log, and in the heartwood subsidiary linkage yields quite a complex burrow system. Complexity is not, however, confined to the heartwood, for the distinction between sap and heart woods—so important to many timber-borers—has no influence on the habits of *C. grevilleæ*—at least, in the rain-forest species studied. At various depths subsidiary tunnels of no considerable length end blindly in the wood and invariably lead to series of grouped pupal chambers.

The final burrow system as illustrated in Plate 184, fig. 2, is the joint work of original infesting adults and their progeny, though the precise contribution of each is uncertain. The parent insects initiate the burrow and carry it down to a depth at which the first batch of eggs are laid. From time to time the female excavates branches in the inner recesses of the heartwood, where further eggs are laid, but the male plays a more or less passive role after mating is completed. It is inferred that the immature forms are chiefly responsible for burrow extension, though the tunnels excavated by the females for the reception of eggs may play a part in forming the main pattern. In the specimen under discussion there are three, and possibly five, burrows leading to the periphery, and it is a moot point whether all these represent points of adult ingress or egress. As some of the main leaders link well within the heartwood, they probably represent inward paths and indicate a linkage of burrow systems, the whole housing the progeny of several original parents. Egress through fissures has been demonstrated in commercial logs, but cannot be the only method of escape, for fissures may be absent from some timbers—*e.g.*, kauri pine, in which development is completed. Newly emerged adults may escape from any surface, and possibly some of the burrows leading to the outside in this specimen



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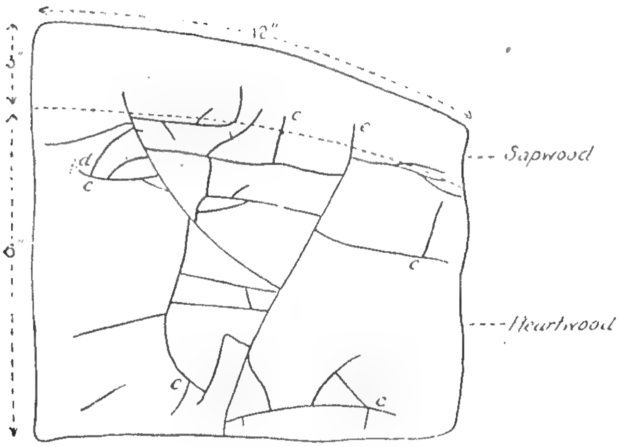

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I. W. Helmsing (after Smith)
1935.

PLATE 184.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Figs. 1 and 2—Burrow systems in walnut bean: (*a*) Entrance burrow; (*b*) sapwood elaboration; (*c*) heartwood elaboration; (*d*) blind tunnels communicating with pupal chambers; (*e*) exit burrows.

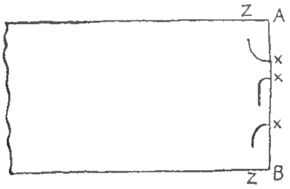
have been excavated by escaping forms. The importance of either mode of escape will largely depend on the character of the wood attacked.

Under natural conditions in the rain-forest, limbs are often attacked in fractures induced by the fall of the tree. Wood thus exposed is infested, though the limbs may not be more than 12 in. in diameter. Under such conditions burrow extension proceeds normally until halted by the bark on the opposite side of the limb, the larvæ often not having reached maturity. Deviations from the normal burrowing habit allow the completion of development, and the adults subsequently escape through the bark. The burrow system peculiar to limb infestation differs in some respects from that in logs cut from the bole of a tree. In these the burrow system is normally confined to a single plane which cuts directly across the grain of the wood. Sawn sections thus expose a large part of the system, while split sections—which naturally follow the grain of the wood—cut across a number of independent systems, each of which appears as a linear series of burrow intersections (Plate 185, fig. 3). Linkage between these has not been seen in commercial logs. In limb infestation, however, burrows along the grain may link separate cross-grain burrow systems or parts of the one system. The connecting burrows may be some inches in length and located at various depths in the wood. A high insect population in a limited wood volume is apparently the cause of the abnormality, for similar connecting links occur when bark infestation is attempted by this species without successful penetration of the sapwood. Here reproduction occurs within the narrow limits of the bark, and some relief would obviously be gained by burrow deviations along the length of the log.

Limb infestation produces a further aberration. When bark is peeled from infested limbs some considerable time after burrow initiation, it is not uncommon to find a network of tunnels on the sapwood surface (Plate 185, fig. 4). These burrows house larvæ in all stages, and occur when further development is hampered by the limited cross-section of the limb. These sapwood surface markings resemble those frequently constructed by *Xyleborus hirsutus* Lea, and usually occur when a large insect population is working in a limited space. Similar phenomena have been noted for other Platypodids.

Lateral infestation is by no means the only method of *grevilleæ* penetration, for end infestation of the log through the sawn surface, particularly the sapwood, is also common. In such cases the burrow follows the grain for a short distance, but ultimately, and characteristically within 1 or 2 in., swings round into the trans-grain direction, when burrow elaboration proceeds as usual (Plate 185, fig. 1). The actual angle at which entry is made does not alter the general position. Adults entering the stump of a tree at the horizontal sawn surface ultimately construct a burrow system in the horizontal plane, while those entering the ends of a cut log finally work in a vertical plane. Burrows parallel to the grain of the wood are thus an exceptional device used in certain circumstances to facilitate the exploitation of the available wood.

The lateral spread of the burrow system from a limited point of entry was clearly demonstrated in some experimental material. Plate 185, fig. 2, illustrates a diagrammatic cross-section through a limb in which the sector AB was the only point of entry. The shaded area indicates the wood tissue exploited by the insects after ten months. The extension of the burrow system is seen to proceed in all directions, though the rapidity of exploitation is greatest in the radial line. Ultimately the whole of the wood may be riddled in the one particular plane.



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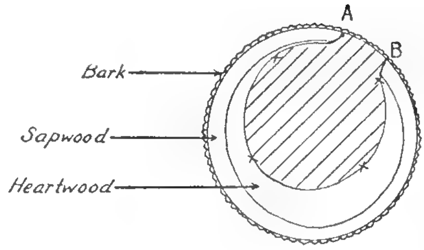

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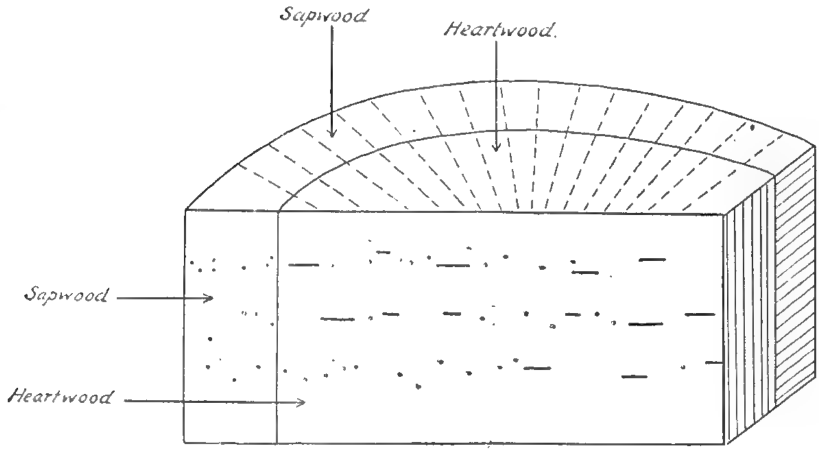

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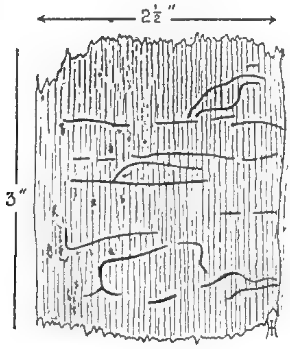

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I. W. Helmsing (after Smith)
1935.

PLATE 185.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Fig. 1—Diagram of burrow formation following end infestation of log. Infestation at xxx on end surface AB. Burrows subsequently excavated in plane ZZ at right angles to length of log. Fig. 2—Diagram of lateral spread of burrow system. Entry at sector AB only. Limits of burrow system xxxx. Fig. 3—Section of walnut bean intersecting three burrow systems. Note that each burrow system cuts across the grain of the wood. Fig. 4—Walnut bean showing sapwood surface burrows beneath the bark.

Feeding Habits.

The tunnels of pinhole borers are usually discoloured through the action of fungi which subsist on the walls. When burrows are vacated, the tunnels may become blocked with a compact hyphal mass, which is often sufficiently cohesive to remain intact when the log or log section is broken up for examination. Prior to this stage the fruiting bodies may be seen fringing the walls. A number of these fungi have been cultured on laboratory media and examined by R. B. Morwood, M.Sc., Assistant Plant Pathologist, who has determined the two chief as examples of the genera Monilia and Pennicillium. Fungi in the genus Monilia are usually regarded as imperfect stages of the higher Ascomycetes.

Pinhole borers have been frequently designated "ambrosia beetles" —a name given because some, if not all, feed on fungi cultivated on the walls of the burrow system. More recently it has been suggested that the larvæ are essentially sap-feeding in habit, subsisting on wood exudates rather than fungal growth. Some inferential data indicate that both methods of feeding are normal to *C. grevilleæ.*

After burrow initiation, débris is thrust from the burrow mouth for some weeks until egg-laying begins; thus, presuming that sustenance at reasonably short intervals is necessary for the adults, their requirements must be met, in the early stages of burrow excavation at least, by sap exudates from the wood tissues broken down.

Within a short period of burrow excavation the walls show some discolouration, which, in part at least, is attributable to the establishment of fungi. Were the growth of these unchecked, the mycelial development would soon block the burrows, and the insects must crop down the fungi if free movement is to continue. Under some circumstances, both larvæ and adults live in a burrow system which is not being extended; thus, after heavy infestation in injured bark, a numerous insect population may subsist in a burrow system which cannot for some months be carried through to the sapwood. Growth and development of the insect are normal, and it may be presumed that the fungal growth on the burrow walls is a satisfactory food during the period.

It appears, therefore, that both fungal and sap-feeding habits can be correctly ascribed to the insect. Possibly fungi are the normal food of *C. grevilleæ*, while sap exudates may serve as an auxiliary food when mycelial growth is not available, or in conjunction with it when burrow extension is in progress.

Duration of Tenancy of a Log.

Under natural conditions, the greatest injury is caused by insects which gain access to the log or felled tree at exposed sapwood surfaces. In the newly cut and handled log most of the sapwood is protected by bark, but after subjection to weathering the bark may fracture, and *C. grevilleæ* penetrates the freshly exposed wood surfaces. This process of bark-loosening may cover a considerable period, and permits the infestation of any one log for some months. The pinhole borer population of a log may thus include the progeny of adults which have gained access to the wood at any time between the date of felling and its removal from the rain-forest environment. Fresh infestation has been observed in the rain-forest on logs felled nine months previously, and the end effect is simply the co-existence of burrow systems initiated at

different times. Under such conditions, it is sometimes difficult to decide whether the known Crossotarsan tenancy of a log is merely the life-cycle of the first invaders only or this plus the difference between the dates of first and last new infestation. Ultimately, however, the whole of the heartwood may be riddled, and this phenomenon is common in commercial logs of, say, 12 ft. girth after a period of eighteen to twenty-four months. Even then immature forms may be found which require some months for the completion of their development. It follows, therefore, that *C. grevilleæ* may be found in logs for three years after felling, the period depending entirely on the suitability of the wood for insect development. Specimens of freshly-cut heartwood from six or seven-year-old logs exercise some attraction for the insect and permit fresh infestation, but under ordinary conditions superficial drying of the sapwood prevents the attraction latent in the core of the log being felt outside. The exposure of the inner wood by either saw or axe merely opens the way for fresh infestation.

Under normal conditions, the Crossotarsan tenancy of the log will thus depend entirely on the amount of wood volume and its stimulus to fresh infestation, the latter being controlled by the rapidity of superficial drying and the presence or absence of freshly exposed surfaces. In some timbers the insect will remain in possession until the whole of the wood is exploited, while in others changes in the wood itself, such as occur in softer species, will compulsorily end the tenancy in a relatively short time.

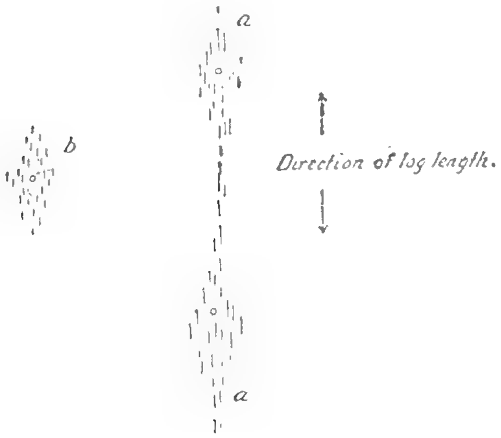
Wound Injuries in the Living Tree.

Wound injuries in which the bark is stripped from the sapwood of the tree are common in the rain-forest, and insects frequently attack the damaged tissues. Sometimes the dimensions of the burrows correspond with those of *C. grevilleæ.*

In 1933 a strip of bark was removed from a standing tree on the edge of a rain-forest clearing during the summer months. Males of *C. grevilleæ* were immediately attracted to the exposed sapwood and initiated burrows, though the rate of infestation was less than in adjacent susceptible log material. Mating subsequently took place and immature forms were recovered from the burrows, the development of the burrow being similar to that commonly found in ordinary felled material.

By analogy with the behaviour of *C. grevilleæ* in logs, the burrow system would be carried further into the wood and the adult progeny would subsequently emerge through the bark. Pupal chambers have not, however, been found within the infested wound tissue, and development may not be completed. Possibly successful reproduction in injured trees depends on the vitality of the plant, for a heavy flow of sap may be inimical to free development of the insect.

A special type of injury is to be found when a tree strikes another in the path of its fall. The bark is then stripped from a tree as before, but at one particular point the sapwood tissue is crushed by the violent impact which takes place. The infestation per unit area at these points is always much greater than at other parts of the exposed sapwood, regardless of other influencing factors. Should the infestation be low, *C. grevilleæ* may attack areas of crushed wood in either the standing tree or the cut log to the exclusion of other susceptible parts. Apparently the chemotropic stimulus associated with infestation is intensified where the sapwood has been crushed.



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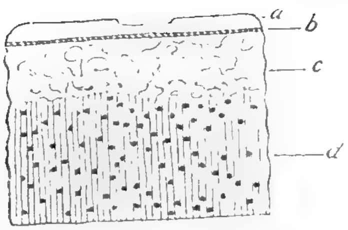

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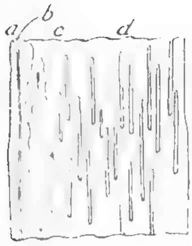

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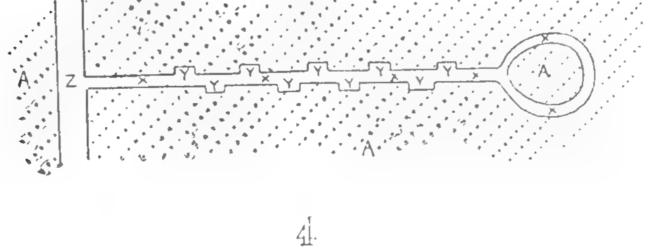

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I W. Helmsing (after Smith)
1935.

PLATE 186.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Fig. 1—Diagram showing discoloured wood tissues adjacent to burrows in living tree: (*a*) Burrows in alignment; (*b*) single burrow. Fig. 2—Diagram showing section through bark of walnut bean: (*a*) Surface corky layer; (*b*) hard whitish layer; (*c*) compacted tissues in process of dissolution; (*d*) matrix of bark showing sclerophyllous columns. Fig. 3—Diagram showing longitudinal section through bark of walnut bean: Details as in Fig. 2. Fig. 4—Diagram of suggested canopy ramp: (A) Rain forest; (X) track under canopy, with turning facilities for teams at end; (Y) dumps for logs; (Z) main teamster track.

Wound injuries of a similar type have been noted in the rose butternut, *B. involucigera,* but these have been caused by the comparatively rare borer *Platypus* sp.

Infestation of the felled log usually induces some discolouration of the wood immediately surrounding the burrow path, the discolouration spreading equally in all directions through the sound wood. In burrow-riddled sapwood of the living tree the discolouration causes a diamond-shaped blemish, the long axis of which is parallel to the bole of the tree. It would thus appear that the fungus or associated organisms responsible for the discolouration are distributed for some distance along the natural lines of fluid conduction in the ordinary transport medium. Should burrows approximate, the fusion of discoloured areas may result, and an example is diagrammatically shown in Plate 186, fig. 1. The discolouration varies from species to species in both extent and colour, rose butternut being a striking example in which the discolouration is a bright yellow, the blemishes covering an area of some square inches.

Significance of Log Faults.

Most commercial logs cut in North Queensland show defects. These flaws are of some moment in the insect economy as they may permit the entrance of adults and the exit of their progeny after the completion of development. The most important flaws may be grouped as follows:—

(*a*) Radial cracks through the centre of the log which may, following fungal breakdown with or without white ant invasion, develop into pipes of some kind or other. Except in so far as these represent the loss of a given volume of wood, they do not present complications in the mill, for trimming is a simple matter when the log is being sawn into flitches. In view of their frequent occurrence in the North, the cause must be common to the whole of the northern area and may possibly be associated with cyclonic blows. After felling, these flaws, whether of the fissure or pipe type, remain comparatively stable, though they may penetrate through the greater part of the commercial length of the tree.

(*b*) Ring shakes and their variations are common features in logs examined on ramps or in timber yards. If located near the periphery of the heartwood, they may not interfere greatly with bench manipulation of the log, but otherwise they may determine the angle of each cut in order to keep wastage to a minimum. In such logs the cutter may have to choose between incurring waste to procure a patterned veneer and sacrificing pattern for the maximum area of wood. In the log they appear as open fissures which, when traced to the point of origin in the stump, are parallelled by obvious weaknesses in the wood. The fissure of the shake is due to the joint influence of the impact at the time of felling and the shrinkage in log volume which takes place later. Logs which show shakes at the time of felling become progressively worse, for shakes tend to extend and often link up by fissures to a central flaw.

Though fissures serve as a convenient channel of escape for emerging adults, their presence or absence makes little or no difference to the development of the species in the log. In a faulty log, adults may escape either through fissures or through the outer surface, and normally both channels are in use, though if sapwood decay is far advanced, fissure

escape is the more important; hence, in the absence of fissures near the core of the log, adults can retrace their steps to the periphery through the ramifications of the burrow system and construct independent exits.

Some infestation does take place through fissures, but only near the outside of the log. Apparently conditions in the inner recesses do not attract the insect. The absence of fissure infestation is mainly due to the unsuitability of the temperatures in the fissure for mass infestation. The actual loss of timber through the burrows initiated towards the outside of the fissure is normally not great, for the burrow systems initiated usually keep to the radial plane and the body of the log remains unaffected.

End infestation of a peculiar type has been observed in a defective water gum, *E. gustavioides*. A ring of tissue some 4 in. from the bark edge was riddled with entrance burrows of *C. grevilleæ*, while that on either side was free from attack. Particular rings of tissue similar to this are not uncommon, and may be due to irregular growth associated with over-maturity, the wood cutting white when dressed in the mill. Perhaps wood of this type represents a structural flaw in which the wood elements differ from the remainder of the log.

A further phenomenon associated with changes in the wood, but here due to fungal contamination, is frequently found in parts of a log showing signs of "doziness"—a tissue breakdown commonly found in logs. Heartwood tissue showing signs of incipient fungal breakdown frequently suffers attack on a heavier scale than healthy tissue alongside.

It seems clear from the examples cited that changes in the tissue of the wood due to a variety of causes may increase its susceptibility to pinhole borer attacks.

Natural Predators.

The described activities of *C. grevillea* are sufficient indication that for at least one phase of the insects' existence parasites can have little influence on the borer population. In the log predators of only the smallest dimensions can come in contact with the insect, and though Clerid larvæ are occasionally found within the burrow system, they apparently make no appreciable difference to the actual *grevilleæ* population; hence, once the burrows are initiated and inhabited by the two sexes, development proceeds normally. The only inhibitions of any consequence depend on the hardness of the wood and the virility of the fungi which take possession of the burrow walls. Should the log be one of the softer wood types—*e.g.*, *Panax Murrayi*—normal disintegration may proceed so rapidly that the wood is reduced to pulp before the development of the insect can be completed, and larvæ, unable to thrive in such a medium, fail to mature. A further danger in such soft woods is to some extent associated with the first, for the growth of burrow-frequenting fungi is particularly rapid. It is not uncommon to find all stages of the insect enveloped in a mycelial mass, the growth of which has been too rapid for the insect population in the burrow system to control. Most rain-forest hosts, however, permit the normal development of the insect, and predatory influences within the burrow are slight.

The free-living habits of the insect are almost unknown except when infestation of a log is taking place and susceptible surfaces are crowded with adults seeking to penetrate the log. They are then subject to predatory dangers, for they lack adequate means of self-defence and

work in exposed situations. It is not surprising that rain-forest Formicids should carry off a considerable number of the borers. Three species are implicated:—

(*a*) *Chalcoponera impressa* Mayr. captures the adults as they move over the surface of the log prior to initiating burrows. It is particularly vindictive and very rarely loses its prey. Not only vagrant adults are taken, but males within the burrow system may be captured as they thrust burrow débris through the outside opening. The hind portion of the body is then extruded, and the ant often remains poised above the burrow opening waiting for a favourable opportunity to seize its prey.

(*b*) *Meranoplus puryi* For. is a smaller species which is more timid in habit than the former. Though it does sometimes capture adults, it is by no means so effective a predator as *C. impressa*; hence, though it may capture the prey either on the surface of the log or at the mouth of a burrow, the victim may be dropped should it show any considerable resistance. Most of the successful captures are injured borers.

(*c*) *Pheidole* sp. is a minute fulvous form smaller than the borer on which it preys. It wanders less than the preceding species and haunts stumps rather than the felled log. It may there be found carrying off *C. grevilleæ* in a very efficient manner.

The Clerid *Omadius yorkensis* Kuw. may also occur on the log surface frequented by borers. As would be expected from its systematic affinities, it is predatory in habit.

These four predatory insects are found on most logs subject to *grevilleæ* infestation and readily destroy any of the borers with which they may come in contact. It is doubtful, however, if they hinder the successful exploitation of a log. There are many reasons for this. The bulk of the burrows are initiated during the first day after the exposure of the sapwood. An influx of predators to a log presupposes an earlier invasion by their prey, and there must always be an interval between the two events. This interval, even if relatively short, gives the males sufficient time to burrow into the wood, for the predatory insect population is not high until a week or so after felling. These predatory insects therefore exercise no appreciable limitation on the number of burrows initiated within a week after felling a tree. Predators may, however, frequent the log concurrently with the females of *C. grevilleæ* and thus impede the normal juxtaposition of the sexes in any one burrow. This may account for the occasional phenomenon in which a log or part of a log is infested with males unpaired even after a lapse of some months. Predators may also limit subsequent infestation on surfaces exposed after the log has been cut.

Burrows sometimes harbour a considerable mite population which preys on the immature stages of *C. grevilleæ*. The net effect may not be great unless the insect population in a restricted wood or bark area is high. Under special circumstances, the loss is appreciable, a common example being found where bark infestation has taken place in mature logs. Infestation has in this case been stimulated by injury to the superficial bark layers, but the burrow system cannot be carried through to the sapwood, and immature forms crowd the limited burrow system which can be constructed in the bark itself. Apparently, conditions

within the bark burrows are suited to the rapid multiplication of the mite, and the larval mortality of the borer may be very high.

In spite of the variety of predators which are partial to *C. grevilleæ* both inside and outside the burrow system, it has to be concluded that their net effect is not great, particularly if weather conditions are suitable for mass infestation and the host log suitable for free development of the burrow system.

BARK RESISTANCE IN THE WALNUT BEAN.

It has already been noted that intact bark is capable of effectively protecting logs from pinhole borer attacks for some months after felling, and this fact has been used, in the previous paper, to suggest logging practices for surmounting ordinary borer difficulties. *C. grevilleæ* does, however, attempt to penetrate the bark, for in many logs small incipient burrows penetrating to a depth of 1 mm. or thereabouts are common. During 1932-34 a number of walnut bean logs varying in girth and bark thickness, characteristics depending on the age of the parent tree, have been under observation. In some of these *C. grevilleæ* penetrated the bark within three months of felling and infested the sapwood. In some instances, though cracks were absent from the bark, the discolouration of the underlying sapwood indicated that moisture soakage through it had already taken place. The insect-infested logs were of non-commercial size with a bark thickness of 8 mm., in contrast to the 12 mm. and upwards mean bark thickness of commercial logs; hence, while the generalisation on bark resistance holds good for the trade, the early breakdown in younger logs suggests an inquiry into the basis of bark resistance to the attacks of *C. grevilleæ.*

Resistance can be of only two types—chemical and mechanical. Were the former the case, some constituents of dead and dying tissues which constitute the greater part of the bark should be inimical to the activity of the insect. Were such constituents of the bark extractable, the liquor should have the property of preventing infestation in wood surfaces otherwise susceptible. An extract was prepared from walnut bean bark by the usual method employed in the manufacture of tannin liquor—*i.e.*, by leaching shredded bark for three hours at a temperature of 60 deg. C. The liquid showed some viscosity and was subsequently broken down with an equal quantity of water for actual log treatment. This extract ought to contain the usual contents of tannin liquors, including the gums, starches, mucin, zylans, inulin, and pectin. Surfaces dressed with the diluted extract actually suffered greater infestation than untreated sapwood, and it would appear that an aqueous bark extract has attractant properties. The heavy infestation of injured though unbroken bark confirms this conclusion. Though the bark after the removal of its water-soluble contents may still possess repellant properties, the behaviour of the aqueous extract suggests that bark resistance to attack is not due to its chemical constitution.

The alternative thesis—*i.e.*, that the mechanical properties of the bark determine its resistance to pinhole borer attack—is supported by both the behaviour of the insects and the macrostructure of the bark. The bark of the walnut bean (Plate 186, figs. 2 and 3) is not a homogeneous layer of variable thickness clothing the sapwood. It consists of at least three layers—

(*a*) An outer layer, homogeneous in structure, reddish in colour, and 1 mm. in thickness.

(*b*) A thin white subsurface layer which is quite hard and capable of being flaked with a scalpel.

(*c*) A diffuse layer comprising the greater part of the bark and made up of a crumbly corklike matrix, in which are interspersed columns of sclerophyllous tissue.

The sclerophyllous columns are roughly circular in cross-section towards the inner part of the bark, but near the periphery disintegration and coalescence take place; consequently, irregular masses of disintegrating sclerophyllous columns are strewn through the matrix, with some concentration near the subsurface layer cited as (*b*). Abortive burrows are common phenomena in logs of all ages. They penetrate layer (*a*), but stop short at layer (*b*); hence it would appear that the borer-resistant properties of the bark depend almost entirely on the latter. If the tree is of sufficient age as expressed in terms of commercial utility, this layer is complete, though of no considerable thickness, but in immature trees its evenness is less evident and thickness less obvious. It seems clear, therefore, that this layer has much to do with some of the characteristic properties of barks. Ordinarily, some months pass under rain-forest conditions before it ceases to afford protection. Water naturally or artificially applied then soaks through the matrix of the bark as a necessary preliminary to its being shed from the sapwood. In open country the breakdown is accompanied by a considerable amount of splitting, but in the rain-forest fungal penetration with associated rotting are more evident features. The natural process of bark-shedding can be greatly accelerated by the removal of the superficial layers (*a*) and (*b*) with either a rasp or a sharp knife. Pinhole borer infestation then takes place immediately through the matrix of the bark and later through the sapwood exposed when splitting takes place. Some months must elapse after felling before bark breakdown is similarly advanced under ordinary conditions, and it must be concluded that the weatherproofing and borer-resistant properties of the bark are largely attributable to the subsurface layer (*b*) and proximate parts of the bark lying close to the periphery.

In young trees of non-commercial girth the development of layer (*b*) is less advanced than in most commercial logs, and their bark breaks down more quickly; consequently, they cease to be borer-proof even before splitting has been initiated—within three months in some susceptible material. The balance between susceptibility and non-susceptibility to *grevillea* attacks in the walnut bean must therefore depend on the superficial layers of the bark and the amount of weathering to which the log or tree is subject. The main influence of weathering depends in turn on the prevalence of contact moisture, which tends to break down the soluble products concentrated in and near layer (*b*). When precipitation is high during the summer months, natural bark breakdown is rapid, though the protection which the bark gives to the log still covers some months.

In logs from which the superficial bark layers have been removed, bark infestation is as great, if not greater, than on exposed sapwood surfaces attacked at the same time; but, curiously enough, subsequent development may not be normal. Given reasonable weather after infestation of the sapwood, the burrow system is rapidly extended and populated with immature forms. After bark infestation in logs cut from mature trees, however, the sequence of events may be quite different.

Burrow development is here inhibited at an early stage, though reproduction continues normally; consequently, some experimental material showed the remarkable phenomenon of heavy infestation and reproduction in the outer half of the bark only, immature forms being crowded together. The burrows lacked any definite orientation, and at the end of a few months had quite an aged appearance, the walls being almost black. Possibly in time the bark may be penetrated and an entrance effected into the sapwood, but it is interesting to note that normal development of the burrow system has been impeded by the inner bark. The limit of penetration coincided with the limits of weathering visible in bark sections.

Intact bark thus hinders the initial infestation of the log, while adults which enter injured bark surfaces may not be able to extend the burrow system to the sapwood. These properties of the bark are apparently due to physical features, layer (*b*) resisting primary infestation, while the closely apposed sclerophyllous columns of the inner bark hamper burrow extension. The experimental data are almost entirely drawn from walnut bean studies, but a comparison of barks in a number of commercial species suggests that the conclusions are similarly applicable, though both the hardness of layer (*b*) and the disposition of the sclerophyllous tissues differ considerably.

[TO BE CONTINUED.]

QUEENSLAND SHOW DATES, 1935.

June.

Marburg, 1 to 3.
Gin Gin, 1 to 3 .
Childers, 3 and 4.
Emerald, cancelled.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Warrilview, 8.
Boonah, 12 and 13.
Gayndah, 12 and 13.
Gladstone, 12 and 13.
Esk, 14 and 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Kilcoy, 11 and 12.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.

July—continued.

Nambour Show, 18, 19; Campdraft, 20.
Cairns, 23, 24, 25.
Atherton, 30 and 31.
Gatton, 31 July and 1 August.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.
Home Hill, 30 and 31.

September.

Brisbane River Carnival and Campdraft, Esk, 6 and 7.
Imbil, 6 and 7.
Pomona, 13 and 14.
Tully, 13 and 14.
Rocklea, 14.
Beenleigh, 20 and 21.
Innisfail, 20 and 21.
Kenilworth, 28.

October.

Malanda, 2 and 3.

A Novel Moth Lure.

By HENRY HACKER, F.R.E.S., Entomologist.

RECENTLY a very interesting spider was forwarded to the Department of Agriculture and Stock for identification, and as it possesses some remarkable habits, a short account of these may be of general interest.

Most spiders catch their prey by means of a web or snare. The species now under discussion—*Dicrostichus furcatus* Cambridge—belongs to a group the members of which, however, are able to attract moths by means of a lure. Its nest or retreat is usually in a small tree or shrub and consists merely of a few leaves drawn together with threads.

Plate 187.
Dicrostichus furcatus Camb. Female spider with lure × 2.

This spider is nocturnal, and when hungry it comes out of its retreat and spins a few inches of silken thread; one end of the thread is fastened to a twig, while to the other is attached an extremely sticky globule. The spider then takes up its position, holding the thread by one of its legs, and patiently awaits its victims (Plate 187). When a moth approaches, the spider whirls the sticky globule around. The nature of the attraction possesed by this globule is not known, but the moth invariably becomes attached to it. Moderate-sized Noctuid moths as well as smaller Lepidoptera have been observed falling victims to this attractive lure. When the spider effects a capture, it hauls up the thread, binds the moth with further threads, and proceeds to suck its juices.

The egg-bags of this species are very conspicuous objects; as many as four or even five may be seen suspended near the retreat, all being the work of a single female. They are nearly 2 in. in length, pale testaceous brown, wide at the point of attachment, then sharply contracted into a narrow neck, beyond which they are spindle-shaped. The outer skin is of smooth parchment-like texture; the interior is thinly lined with loose silk and filled with white globular eggs.

The young spiders hatch inside the bag and duly penetrate to the outer envelope, which they pierce. On emergence, each one spins a fine silken thread, then, loosening its hold, floats away. By this means they are dispersed for considerable distances from the original spot at which they hatched out.

HOW TO HOLD THE REINS WHEN RIDING.

During a discussion recently among a number of horsemen the growing practice to hold the reins when riding with both hands was severely criticised and defended with equal vigour by those who contended that it was the correct manner. Those who uphold the use of one hand only have solid backing for their views. Take the army as a case in point. Riders use only one hand, usually the left. The mounted police in this State use only one hand.

A dip back into the pages of the past depicting riders of other days, esquestrian statuary and paintings of horsemen of olden times will disclose riders with the reins in but one hand. It is the universal practice among Australian stockmen. In hunting or galloping, however, it is usual to use both hands.

Of late years the number of riders appearing in the show ring who use both hands has been very pronounced. No doubt this is the outcome of training in early youth. It is held by some that riders of this style maintain more effective control over their mounts. But what of such riders as the mounted police, who, time and again, have demonstrated the control they have over their mounts when riding with one hand?

Would it not be possible to set up some standard of horsemanship for the guidance of show judges as is done in other countries? In common with using both hands on the reins there has been a decided tendency for riders of the younger generations to use a very short stirrup—quite alright for hunting or galloping, but which looks out of place in the show ring.

It would be interesting, therefore, to have the views of experienced judges on these and other points upon riding in the show arena and elsewhere.—"Book Book" in "Country Life."

Quality in Bright Tobacco and Home Grading.

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THERE is no doubt the dissatisfaction expressed by many tobacco growers at their inability to sell or to secure adequate prices for their product would be largely obviated if the essentials of quality were better understood.

Complaints are made of inconsistency in the offers for lots of high grade leaf that growers maintain were of equal quality, but the greatest outcry is due to the low prices realised, or the lack of offer, for dark and inferior leaf.

In the absence of keen competition amongst purchasers, it is probable the prices for even grades of good quality may vary somewhat, but is has not been observed that such disparity was, in any season, extraordinarily remarkable. The prices, however, paid for inferior grades have shown divergences for which satisfactory reasons cannot be adduced. Such disparities infer that below a certain standard the degree of quality is not always a determining factor. They certainly show very plainly that inferior grades are not desired.

In any question there are at least two points of view, in that of quality of tobacco, there are certainly three—namely, the grower's, the manufacturer's, and the consumer's. Of these, that of the last named is the most important, since his inclination impresses the manufacturer and thus influences the demand from the grower. In this direction buyers have shown by their ready purchase that all bright grades, exclusive of trashy leaf, as well as the best of dark grades, are in good demand and by their reluctance that inferior grades, especially of leaf harvested under-ripe, are not desired.

In Australia the average quality of tobacco demanded by the consumer has been stated by competent authorities to be superior to that in other lands. This is no doubt due to the fact that until quite recently well over 90 per cent. of that consumed was imported in leaf form or already manufactured. As duty is paid on weight without regard to quality, it is improbable inferior leaf received any consideration from importers. Growers, therefore, should fully realise Australian consumers, on the whole, desire a quality to which they are accustomed and cannot be expected to take kindly to an inferior article. Also, the habit of smoking is encouraged by the satisfaction experienced therein. Any measure calculated to enforce the consumption of an inferior quality, such as by a partial or total prohibition of import or by the imposition of such an increase in duty as would result in the price of the article rising beyond reach, could not be calculated to help the grower. Rather would consumption rapidly decline and the market be still confined to leaf of reasonably good quality.

It should also be remembered that popular taste in tobacco has shown a marked alteration, especially in the last twenty years. Such a change appears concurrent with the general adoption of the flue-curing process. Efficiently so cured the leaf, when grown under the most

suitable conditions of soil and climate and harvested at the correct stage of ripeness, possesses a natural flavour and aroma, so satisfactory as not to suggest possibility of improvement. As a result of this, a modification in the process of manufacture eventuated. Formerly it was the practice to treat the leaf with various sauces, to add aromatic substances and by other agencies, to overcome deficiencies or seek improvement in flavour and aroma. To-day the art of manufacture consists most largely in the blending of various grades of leaf to secure a degree of natural flavour and aroma calculated to make the greatest appeal to the consumer. The reagents now employed in the process of manufacture, being in themselves neutral, are not calculated to cover any deficiency or to add in any way to quality.

As is well known, leaves borne on different parts of the plant and classed, respectively, as lugs, wrappers, fillers, and cutters, vary in size (superficial area) and body (thickness) with the climatic conditions and the class of soil on which the plant is grown. In proportion as body increases so does the content of nicotine and other properties that combine to produce flavour and aroma.

The smoking aroma also will vary somewhat with the district—more particularly in relation to degrees of latitude in Australia—and with the country. Regarding the latter there is a pronounced difference between the aromas of Australian, African, American, and Asiatic tobaccos, though the best of each is most agreeable.

Further, the aroma of certain kinds of tobacco leaf such as Burley, Turkish, &c., are distinct from that of bright tobacco wherever grown. In addition, the ageing or storage of leaf under appropriate conditions for a year or more is found to result in improvement in smoking quality. A parallel to this is suggested in the ageing of wine or whisky when held in wooden casks. The reason of the improvement is not understood and, so far, no process has been found to produce the same effect with either tobacco or wine. The storage of tobacco leaf, however, beyond a year, appears to be confined to the choicer grades, of which the supply is not certain each year. Manufacturers thus have at their disposal Australian leaf of varying degrees of strength (flavour and aroma) according to body and the district in which it was produced. They are also able to import from other countries bright leaf and leaf of other kinds in which flavour and aroma are distinct from Australian as well as each other. Opportunity is consequently afforded to blend Australian leaf of various grades in definite proportions to secure smoking mixtures calculated to satisfy the varied requirements of consumers.

Under competition, it is natural for efforts to be made to secure a greater share of patronage by providing further blends to titillate the palate. Thus leaf from foreign countries and of other kinds are used wholly or as admixtures.

With such an objective it cannot be expected that inferior grades of leaf will meet with consideration. Growers should be aware the demand for quality leaf is instituted primarily by the consumer. Also that when the price of the manufactured article is increased, economy will be effected in other directions or consumption lessened rather than attention be given to a cheaper and less satisfying substitute.

Quality Essentials.

The qualities of bright tobacco may be determined as "burn," "ash," and "aroma" in regard to smoking characteristics, and "size," "colour," and "texture" to leaf appearance.

Burn.—The ability of the cured leaf, when manufactured, to hold fire will be recognised as most important. When a pipe or cigarette has to be continuously drawn upon to keep the tobacco alight the burn is suggested as very poor. On the other hand when a cigarette or pipe can be set down for two or three minutes without a cessation of combustion the burn is characterised as very good or excellent. Similarly with the leaf alone, when the glow ceases immediately it is taken from contact with a flame, it is said to have a bad burn, while if the line of fire proceeds slowly and evenly without flame or coaling for some seconds it is proportionately classed as fair, good, very good, or excellent.

A bad burning quality is generally due to an excess of chlorides in the soil frequently associated with sodium as common salt in areas close to the sea. The burn of Queensland tobacco leaf in present producing districts has been found to be uniformly good.[1] Care, however, should be exercised in the inclusion of chloride or muriate of potash in the fertilizer mixture as an excess beyond 2 per cent. besides exerting an unfavourable effect on the burning quality of the leaf is said to injure growth and produce a thick brittle leaf which, when cured, becomes thin soggy and dull in colour.[2]

Excess of nitrogen also is liable to affect the burn[3].

The burn of immature leaf is much less satisfactory than of that allowed to ripen on the plant.

Ash.—The colour and consistency of the ash of Queensland tobacco is also generally satisfactory[1]. It should preferably be light in colour, white to grey, rather than darker, and should be fine and soft to touch. The formation of a coal is not desirable.

Aroma.—It is somewhat difficult to define exactly what is covered by the term "aroma," since it includes the fragrance, or otherwise, noted by the olfactory nerves and the flavour and general effect registered on tongue and palate. The quality of aroma may be described as from poor to excellent, light to full flavoured, mild to very strong, and passable to agreeable, or, pungent, sharp, bitter, acrid, objectionable, &c., according to the effect experienced.

A good or agreeable aroma will be evidenced by a soothing effect on tongue and palate, accompanied by a feeling of fulness without heat in the mouth when the smoke is drawn in and a pleasurable effect on the sense of smell.

The taste of the cured leaf when chewed is also a guide to quality in smoking aroma; it should possess a degree of sweetness.

The quality of aroma as was previously noted varies with the district and again with the country in which it is grown. In each case it may be quite distinct but at the same time wholly satisfactory.

The degree of aroma or the amount present in the leaf is dependent on the texture, the position of the leaf on the plant, and the stage of ripeness when picked. It varies with varieties and with quality is affected by the soil and climate during growth. The middle leaves

being the largest leaves and also heavier bodied than others on the same plant, possess a greater degree of aroma than cutters or thin leaf, much of which is almost neutral or the degree of aroma so light as to be hardly perceptible. By blending leaves of differing body the degree of aroma is controlled in the manufactured article, while the quality may not be altered. By blending leaf of different kinds of tobacco, as well as that from different districts and countries, the quality, as well as the degree of aroma, is influenced. Leaf picked at the correct stage of ripeness and efficiently cured presents a much superior appearance and possesses flavour and aroma to a fuller and more acceptable degree than when harvested either under or over-ripe.

A parallel may be noted in the greater attractiveness of dessert fruits when allowed to become fully ripe before being picked from the tree.

In proportion as the harvested leaf departs from full ripeness so will its smoking quality decline. Over-ripe leaf when cured is found to have less aroma and usually carries an amount of dead tissue proportionate to the period beyond which it should have been picked.

Under-ripe leaf also carries less aroma both in quality and quantity and, as it declines from ripeness, presents a more or less bitter and disagreeable flavour.

Though under-ripe leaf may by skill be cured a more or less yellow colour, buyers will detect immaturity by the leaf odour, which becomes more rank and objectionable with departure from ripeness.

Disease and frost are not infrequently the cause of defective aroma.

Rootrots and nematode infection induce a yellowing of leaf on the plant much earlier than the period of normal ripening. This colouring presages the decay of the leaf from lack of nutrition due to the defective root system. Such leaf is, of course, more or less under-ripe.

Heavy applications to the soil of dung or other manures which induce a rank growth through excess of nitrogen can also be responsible for bad aroma. Where suckering is neglected the aroma of the leaf is less in quantity rather than quality.

There has been some disagreement amongst authorities as to the relative importance of soil and climate in influencing aroma in tobacco, but in recent years preponderance of opinion suggests that the character or quality of the aroma is due to the soil and its degree or quantity to climatic influence.

Little is known of the leaf constituents responsible for aroma in tobacco or of any method of soil treatment that would result in improvement. It is, however, known that by certain additions it can be impaired, so it is reasonable to suppose the result of experiments in that direction may influence improvement in the future.

Slagg[1] found that ripe leaf grown in most of the Queensland districts possessed a good aroma. Manufacturers also, by their ready purchase of good textured leaf from all producing districts, have indicated appreciation thereof.

Being cognisant of the smoking characteristics of leaf from each district, buyers do not find it necessary to make a test before each

purchase. They are guided in estimation of quality by leaf appearance, particularly in regard to colour and texture.

Colour.

As indicated previously the smoking qualities of tobacco leaf covered by the term "aroma" are influenced by the soil on which it was grown, the seasonal conditions then operating, the stage of ripeness at which it was picked, and the efficiency of cure. Brightness of colour is an indication of the degree of ripeness attained when the leaf was picked and of the efficiency of cure. Its degree or lustre is definitely influenced by the amount of organic matter in the soil.

In fully-ripe, well-grown leaf that has been properly cured the colour range from lemon to dark will indicate increase in body. Under such conditions it would be equally impossible to properly cure a heavy leaf a lemon colour or a light leaf mahogany or dark.

The colour range may be described as follows:—

Lemon.—The colour of a freshly ripened lemon or that of flowers of sulphur.

Orange.—As suggested, the colour of a freshly ripened orange or a deeper and more pronounced yellow than lemon.

Bright Mahogany.—Yellow with a reddish cast to pale red, sometimes barred with light red and yellow.

Mahogany.—Bright red or in which a red colour predominates.

Dark.—Dark red to a ruddy brown.

Green.—As its name implies, any leaf wholly green or which has a decidedly green cast.

Colour shades may be expressed as (*a*) pale; (*b*) light; (*c*) true colour; (*d*) dusky; and (*e*) dark.

Finish.—The term "finish" alludes to the general appearance of the leaf, and is described as (*a*) flashy or bright; (*b*) clear; (*c*) normal finish; (*d*) dull; (*e*) cloudy; and (*f*) dingy.

Flash Tobacco.—There is a shining brightness as if the surface of the leaf reflected light, frequently associated with leaf from the first crop on virgin soil; also on soils in which the supply of organic matter is kept up. This by manufacturers is termed "flash tobacco," and always commands, other qualities being equal, a better price.

In certain manufactures where brightness of colour is considered an additional attraction to smoking quality such leaf is eagerly sought.

Clear Finish signifies absence of blemish from sponging during cure, injury from disease, insects, &c., or damage from other cause.

Normal, dull, cloudy, and *dingy* finishes are sufficiently informative, and suggest full or insufficient ripeness, over-ripeness, or inefficient curing. In the latter three the trouble is frequently caused when the barn is filled with leaf of unequal ripeness or when rise of temperature is unduly delayed or ventilation is faulty. "Sponging" is a term commonly applied to defective finish.

Fibre Colours.—In relation to the leaf colour, that of the veins is determined as conforming, blending, emerging, contrasting, and clashing.

Leaf Aroma.—This is distinct from what is generally understood by aroma as a smoking quality, and refers to the odour of the leaf, particularly when a quantity is freshly drawn from the bulk or package. Ripe leaf presents a sweet, attractive odour suggestive of honey. A barn of freshly cured ripe leaf often emits such a perfume when the door is opened. Also in the bulk shed the aroma of the cured ripe leaf is usually pronounced and remarkably pleasant. In proportion to the decrease from ripeness of the leaf when picked, so will the sweet odour be lessened or replaced with a rank, nauseous, and objectionable smell. "Wet dog" is a buyer's term for the disodour associated with cured unripe leaf. Though skill in curing may secure a more or less yellowish colour or one free from green in such leaf, it cannot dissemble the particular leaf aroma peculiar thereto. This quality of leaf aroma may possibly explain the variations in price of which much complaint is made by growers.

Maturity.—This is decided by colour and leaf aroma as (*a*) overripe; (*b*) mellow or thoroughly ripe; (*c*) ripe; (*d*) unripe; (*e*) immature; and (*f*) crude.

Cure.—This is expressed as well cured or by names indicating certain characteristics of excessive, insufficient, or improper curing.

Cleanness.—Freedom from foreign matter—*e.g.*, dirt, suckers, string, &c.

Texture.

Under the general term of "texture" are grouped a number of qualities determined by superficial observance as well as during handling. They may be briefly described as follows:—

Soundness.—(*a*) Sound (free of damage); (*b*) unsound (under 20 per cent. damage); (*c*) badly damaged (over 20 per cent.) The term "damage" refers to the effect of fungus or bacterial diseases which attack tobacco leaf after it has been flue-cured, such as mould during bulking; it includes tobacco having the odour of mould, must, or rot.

Injury.—This is distinct from damage, and is defined as hurt or impairment from any other cause. Injured tobacco shall include any dead, burnt, hail-cut, or ragged leaves; or leaves that have been torn or broken, frozen or frosted, sunburned or scalded, scorched or firekilled, bulk-burnt or steam-burnt, pole-burnt or house-burnt, bleached or bruised; or discoloured or deformed leaves; or tobacco hurt by insects; or tobacco having an odour foreign to the type; or tobacco affected by rust, frog-eye, mosaic, frenching, or other diseases. It is expressed as the amount or percentage of injury.

Flatness.—(*a*) Flat; (*b*) even or plain surface; (*c*) wavy, shrunken, or loosely drawn; (*d*) crinkled or puckered; (*e*) wrinkled or tightly drawn; and (*f*) curled, twisted, or distorted.

Texture.—(*a*) Fine; (*b*) good; (*c*) medium; (*d*) fair; (*e*) poor.

Smoothness.—(*a*) Silky; (*b*) smooth; (*c*) unrough; (*d*) coarse; and (*e*) rough.

Grain.—(*a*) Grainy, and (*b*) not grainy or free of grain.

Porosity.—(*a*) Spongy; (*b*) porous; (*c*) open weave; (*d*) close weave; and (*e*) tight weave.

Oil (or Life).—(*a*) Fat; (*b*) rich in oil; (*c*) oily; (*d*) lean or low in oil; and (*e*) lifeless or dead.

Wax.—(*a*) Waxy, and (*b*) free of wax.

Solidity.—(*a*) Hard or woody; (*b*) compact; (*c*) firm; (*d*) flabby; and (*e*) flimsy.

Body.—(*a*) Thick or heavy; (*b*) fleshy; (*c*) medium body; (*d*) thin; and (*e*) tissuey.

Strength (Tensile).—(*a*) Tough; (*b*) strong; (*c*) normal strength; (*d*) weak; (*e*) tender.

Elasticity.—(*a*) Elastic; (*b*) semi-elastic; (*c*) stretchy; and (*d*) non-elastic.

Fibre Size.—(*a*) Fine fibres; (*b*) small fibres; (*c*) medium fibres; (*d*) large fibres; and (*e*) coarse fibres.

Venation.—Expressed as the number of degrees in the average angle between the main fibres (veins) and the midrib.

Width.—(*a*) Broad; (*b*) spready; (*c*) normal width; (*d*) narrow; and (*e*) stringy.

Length.—When length is not of sufficient importance to be treated as a separate factor, it is treated as an element of quality.

Shape of Tip.—(*a*) Round; (*b*) oblate or normal tip; and (*c*) sharp or pointed.

Grading.

The foregoing is designed to give some indication of what constitutes quality in flue-cured tobacco and to stress the fact that ripeness of leaf at harvest is the first essential thereof.

As the smoking qualities of aroma, burn, and ash from present Queensland producing districts are accepted as satisfactory by manufacturers provided the leaf was sufficiently ripe when picked, their offers of purchase are consequently based on the visible characteristics of size, colour, texture, injury, and damage. Leaf in which quality is uniform neatly tied into medium-sized hands provides an attraction to the buyer, and invariably results in a more profitable return than would be the case if colours were mixed, quality varied, lengths too uneven, and hands roughly tied.

Standard Grades.—In a systematic classification of leaf it would first be divided into groups suggestive of body or thickness with attendant quality and its use in manufacture. Each group would then be divided into colours and further separated into a number of qualities dependent on leaf characteristics and injury or damage, if any.

With some experience the grower could more or less easily separate his leaf into groups and colours, but would meet difficulty in accurately grading into definite qualities.

A standard of grades would suggest a corresponding scale of prices as a desirable concomitant. Needless to state such a combination would require a degree of accuracy in classification hardly possible on the average farm.

A leaf warehouse, preferably on co-operative lines, with a trained staff to determine quality and to further classify when necessary, could be calculated to economically overcome defects in home grading. Such an organisation, provided standard grades and prices were adopted, would naturally become a selling agency through which possibly advances on leaf could be secured and growers' requirements supplied at minimum cost. It would suggest control of the industry by growers and the practicability of co-operative manufacture to counter any understanding among buyers to control prices.

A further advantage and one which would favour the monetary return to the grower would be the buyers' knowledge that leaf from such a leaf warehouse would be dependable not only in accuracy of classification but in storage condition.

At the present time much of the leaf received at factories has to be carefully examined as to grade and to be reconditioned for storage. The expense of this being obviated, would probably allow an advance in price equivalent to the charges of the leaf warehouse in that respect.

Standard grades have been established for many types of tobacco in the United States of America, and are utilised in the activities of the tobacco-grading service maintained by the Bureau of Agricultural Economics in co-operation with State Departments of Agriculture or similar administrative units there.

The function of the tobacco-grading service in so far as the auction markets are concerned is to inspect the tobacco delivered by farmers and label it according to its grade before the sale takes place. The grade is announced to the buyers, so that they as well as the growers are apprised of the grade and quality of the tobacco according to United States standards. As a part of this service the sales of graded tobacco are analysed, and reports are issued daily that show the average prices paid for each grade. By furnishing the grower information on the grade of his tobacco and the average selling price he is enabled to judge intelligently whether the price is reasonable and whether he should accept the sale. It is found at times the mere announcement of the official grade of given lots of tobacco enhances the prices paid to the growers.[4] The standard grades for flue-cured tobacco formulated by the United States Department of Agriculture,[5] to which pleasurable acknowledgment is given for assitance in defining the elements of quality, &c., provides for divisions as follows: —

Groups.	*Qualities.*	*Colours.*
A—Wrappers	1—First quality ..	L—Light or lemon
B—Leaf	2—Second quality ..	F—Medium or orange
C—Cutters	3—Third quality ..	R—Red or mahogany
X—Lugs	4—Fourth quality ..	D—Dark red or walnut
N—Nondescript ..	5—Fifth quality ..	G—Green or green mixed
S—Scrap	6—Sixth quality ..	

The adopted order of grade marks is as follows:—Group factor first, quality factor second, and colour factor third. Thus wrapper leaf would be given the factor A for the group, the second factor would refer to the quality (as first, second, or third), while the third factor would refer to its colour. In this manner A 1 L would represent wrappers of first quality in lemon colour, B 3 R would represent leaf of third quality in red or mahogany colour, and so on.

Provision is made for special factor symbols to form subgrades by placing a particular letter signifying same after or above the standard grade symbol. These, of course, would rarely be applied to properly graded leaf unless to qualify smoking leaf or primings.

Group Definitions.

Wrappers.—Any leaf which is clean, sound, smooth, elastic, oily, ripe, firm, and strong, and which has a bright finish, small to medium-sized and blending fibres, normal width, and not more than 5 per cent.

injury. In the wrapper grades a minimum length or size may be specified and a tolerance provided for leaves other than wrappers.

Leaf.—Tobacco which is medium to thick in body as compared with the average body of the type (in case leaf from different parts of the State is so determined) and which does not have the characteristics of lugs. Leaf is frequently referred to as heavy leaf, fillers, or tips.

Cutters.—Tobacco which is very thin to medium in body as compared with the average body of the type and which has the characteristics of lugs except with respect to injury and finish. Cutters are frequently referred to as thin leaf.

Lugs.—Any lot of tobacco, except nondescript and scrap, composed chiefly of comparatively thin and lean leaves, and showing a material amount of injury of the kind characteristic of leaves grown near the ground; or any tobacco, except nondescript and scrap, injured or containing lug leaves in excess of the tolerance allowed in the grades of the B and C groups. Lugs are ordinarily composed of leaves from near the bottom of the plant, and they are normally characterised by a dull or dingy finish.

Nondescript.—Any nested tobacco, or muddy or extremely dirty tobacco, or tobacco containing an unusual amount of foreign matter, or crude tobacco (very immature), or tobacco damaged to the extent of 20 per cent. or more, or tobacco infested with live tobacco beetles or other injurious insects, or wet tobacco, or incompletely cured tobacco, including fat stems and wet-butts, or very inferior lots of tobacco of the quality that is not ordinarily marketed, or tobacco having characteristics distinctly foreign to tobacco of other groups of the type.

Scrap.—A by-product from handling tobacco in both the unstemmed and stemmed forms, consisting of loose and tangled portions of tobacco leaves, except stems, which accumulate in warehouses, packing and conditioning plants, and stemmeries.

Smoking Leaf.—The thin side or characteristic of leaf grades having prominent fibres (bony leaf) and characterised by being non-elastic, low in oil, mellow, very grainy, porous, and showing a considerable amount of injury of the kind normally found in very grainy or overripe tobacco. Smoking leaf is determined a subgroup and designated by the letter "H" placed after or above the standard grade symbols.

Primings.—Any lugs composed of very thin, pale, silky, and premature leaves very low in oil and wax and of a dull and dingy finish. Priming lugs are the extreme opposite of grainy or overripe lugs. Primings should not be confused with the method of harvesting known as priming. Primings are treated as a subgroup and designated by the letter "P."

Qualities and Colours in each Group.—All qualities and colours shown in the divisions previously mentioned do not appear in each group of the American standards.

Wrappers are divided into three qualities and three colours only—namely, first, second, and third qualities in lemon, orange, or mahogany. Lower qualities and deeper colours than third quality in mahogany would be included in leaf or lugs according to body or thickness.

The *Leaf* group comprises six qualities in each of the lemon, orange, and mahogany colours. Neither first nor second qualities are considered when the colour is dark or green. In each of these colours the grades are, respectively, third, fourth, fifth, or sixth.

The *Cutter* group comprises first, second, third fourth, and fifth qualities in two colours only—lemon and orange. Deeper colours would be classed in the Lug group as well as a quality lower than fifth.

The *Lug* group comprises first second, third, fourth, and fifth qualities in lemon, orange, and mahogany only. There is no provision for dark colours, while green colour is placed in third, fourth, or fifth quality.

Nondescript and *Scrap* are not graded.

Uniformity.—The first essential in grading is to sort the leaves into lots of like group possessing similar qualities and colour. Values will be influenced by the degree of uniformity showing the percentage of a lot that may be of a distinctly different group, quality, or colour from the run of the lot. Such degree may be expressed as (*a*) uniform (less than 5 per cent.); (*b*) harmonising (less than 10 per cent.); (*c*) unmingled (less than 20 per cent.); (*d*) mingled or unmixed (less than 30 per cent.; and (*e*) mixed (over 30 per cent.). In American standard grades provision is made for subgrades. As explained previously under "Smoking Leaf" and "Primings," the letters "H" and "P," respectively, are applied to or in place of the group symbol.

Other special factor symbols are used after or above the grade marks to form other subgrades:—

K. *Off Colour.*—Tobacco of which 20 per cent. or more of its leaf surface has a grey, mottled, bleached, or foreign colour which does not blend with the normal colours of the type; or tobacco which does not blend reasonably well in its proper grade on account of some peculiar characteristic.

M. *Mixed.*—A lot of tobacco of which 30 per cent. or more of its leaves are of a *distinctly different* quality and/or colour from the run of the lot and which contains less than 20 per cent. green.

T *Tips.*—Self-explanatory.

V. *Greenish Tinge.*—Tobacco of which 20 per cent. or more of its leaf surface has a decided greenish cast; or tobacco which is not 20 per cent. green but which has 20 per cent. of green and greenish cast combined.

L. *Light Green.*—Qualifying a green grade.

D. *Dark Green.*—Qualifying a green grade. Green tobacco is so classed if 20 per cent. or more of its leaf surface is predominantly green in colour.

U. *Unsound* or damaged, under 20 per cent.

W. Doubtful keeping order.

Arrangements of Grades.

The following American standard grades are arranged according to group and quality. General specifications are shown for each group. Opposite each grade symbol is a grade name or description and its specifications. The specifications and descriptions cover only the three grade factors—group, quality, and colour. A careful study should be made of definitions, elements of quality, before applying the specifications:—

WRAPPER GRADES (A GROUP).

General Specifications.—All grades of the A group must be clean, sound, ripe, firm, strong, and over 16 inches long, must have an open

weave, light to true colour shade, clear to bright finish, and small to medium size and blending fibres.

General Tolerance.—Five per cent. injury of a nature affecting wrapper yield.

U S Grade.	Grade, Description, Specification, and Tolerance.
A 1 L ..	Choice quality wrapper in Lemon colour. Very silky, very fine texture, very elastic, oily, thin to medium body, spready, uniform. Tolerance: 20 per cent. leaves of a quality not lower than B 2 or C 3.
A 1 F ..	Choice quality, wrapper in Orange colour. Very oily, medium to fleshy body; otherwise same as A 1 L.
A 1 R ..	Choice quality wrapper in Red or Mahogany colour. Rich in oil, fleshy to heavy body; otherwise same as A 1 L.
A 2 L ..	Fine quality wrapper in Lemon colour. Silky, fine texture, elastic, oily, thin to medium body, spready, uniform. Tolerance: 40 per cent. leaves of a quality not lower than B 2 or C 3.
A 2 F ..	Fine quality wrapper in Orange colour. Very oily, medium to fleshy body; otherwise same as A 2 L.
A 2 R ..	Fine quality wrapper in Red or Mahogany. Rich in oil, fleshy to heavy body; otherwise same as A 2 L.
A 3 L ..	Good quality wrapper picker in Lemon colour. Fairly silky, good texture, semi-elastic, oily, thin to medium body, normal width, fairly uniform. Tolerance: 60 per cent. leaves of a quality not lower than B 2 or C3.
A 3 F ..	Good quality wrapper picker in Orange colour. Very oily, medium to fleshy body; otherwise same as A 3 L.
A 3 R ..	Good quality wrapper picker in Red or Mahogany colour. Rich in oil, fleshy to heavy body, otherwise same as A 3 L.

LEAF GRADES (B GROUP).

General Specifications.—All grades of the B group must be clean, sound, medium to heavy body, and must not exceed the tolerance specified with respect to injury and lugs.

U S Grade	Grade Description, Specification, and Tolerance
B 1 L ..	Choice quality leaf in Lemon colour. Very smooth, very good texture, stretchy, oily, ripe, firm, medium body, strong, normal width, open weave, light colour shade, bright finish, medium size and blending fibres, uniform. Tolerance: 5 per cent. injury.
B 1 F ..	Choice Quality leaf in Orange colour. Very oily, medium to fleshy body; otherwise same as B 1 L.
B 1 R ..	Choice quality leaf in Red or Mahogany colour. Rich in oil, fleshy body; otherwise same as B 1 L.
B 2 L ..	Fine quality leaf in Lemon colour. Smooth, good texture, stretchy, oily, ripe, firm, medium body, strong, normal width, open weave, fairly light colour shade, bright finish, emerging fibres, fairly uniform. Tolerance: 10 per cent. injury.
B 2 F ..	Fine quality leaf in Orange colour. Very oily, medium to fleshy body; otherwise same as B 2 L.
B 2 R ..	Fine quality leaf in Red or Mahogany colour. Rich in oil, fleshy body; otherwise same as B 2 L.
B 3 L ..	Good quality leaf in Lemon colour. Fairly smooth, fair texture, fairly oily, ripe, firm, medium body, fairly strong, normal width, true colour shade, clear finish, harmonising. Tolerance: 15 per cent. injury.

B 3 F .. Good quality leaf in Orange colour.
Oily, medium to fleshy body; otherwise same as B 3 L.

B 3 R .. Good quality leaf in Red or Mahogany colour.
Rich in oil, fleshy body; otherwise same as B 3 L.

B 3 D .. Good quality leaf in Dark Red or Walnut colour.
Rich in oil, heavy body; otherwise same as B 3 L.

B 3 G .. Good quality leaf in Green colour.
Quality of B 3 or better, except maturity.

B 4 L .. Fair quality leaf in Lemon colour.
Unrough, fairly ripe, medium body, normal strength, not stringy, fairly true colour shade, fairly clear finish, unmingled. Tolerance: 20 per cent. injury and 10 per cent. lugs of the quality of X 3 or better.

B 4 F .. Fair quality leaf in Orange colour.
Medium to fleshy body; otherwise same as B 4 L.

B 4 R .. Fair quality leaf in Red or Mahogany colour.
Fleshy body; otherwise same as B 4 L.

B 4 D .. Fair quality leaf in Dark Red or Walnut colour.
Heavy body; otherwise same as B 4 L.

B 4 G .. Fair Quality leaf in Green colour.
Quality of B 4, except maturity.

B 5 L .. Low quality leaf in Lemon colour.
Fairly ripe, medium body, dusky colour shade, dull finish, unmixed. Tolerance: 30 per cent. injury and 20 per cent. lugs of the quality of X 3 or better.

B 5 F .. Low quality leaf in Orange colour.
Medium to fleshy body; otherwise same as B 5 L.

B 5 R .. Low quality leaf in Red or Mahogany colour.
Fleshy body; otherwise same as B 5 L.

B 5 D .. Low quality leaf in Dark Red or Walnut colour.
Heavy body; otherwise same as B 5 L.

B 5 G .. Low quality leaf in Green colour.
Quality of B 5, except maturity.

B 6 L .. Common quality leaf in Lemon colour.
Fairly ripe, medium body, dark colour shade, dingy finish. Tolerance: 40 per cent. injury and 30 per cent. lugs.

B 6 F .. Common quality leaf in Orange colour.
Medium to fleshy body; otherwise same as B 6 L.

B 6 R .. Common quality leaf in Red or Mahogany colour.
Fleshy body; otherwise same as B 6 L.

B 6 D .. Common quality leaf in Dark Red or Walnut colour.
Heavy body; otherwise same as B 6 L.

B 6 G .. Common quality leaf in Green colour.
Quality of B 6, except maturity.

CUTTER GRADES (C GROUP).

General Specifications.—All grades of the C group must be clean, sound, thin to medium body, must have an open weave, and small to medium size fibres, and must not exceed the tolerance specified with respect to injury and lugs.

U S Grade — Grade Description, Specification, and Tolerance.

C 1 L .. Choice quality cutters in Lemon colour.
Very silky, fine texture, oily, thoroughly ripe, firm, thin body, fairly strong, spready, light colour shade, bright finish, blending fibres, uniform. Tolerance: 5 per cent. injury.

C 1 F .. Choice quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 1 L.

C 2 L .. Fine quality cutters in Lemon colour.
Silky, very good texture, oily, thoroughly ripe, firm, thin body, fairly strong, fairly spready, light colour shade, very clear finish, blending fibres, fairly uniform. Tolerance: 10 per cent. injury.

C 2 F .. Fine quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 2 L.

C 3 L .. Good quality cutters in Lemon colour.
Very smooth, good texture, fairly oily, ripe, fairly firm, thin body, normal strength, normal width, fairly light colour shade, clear finish, emerging fibres, harmonising. Tolerance: 15 per cent. injury and 10 per cent. lugs of the quality of X 2 or better.

C 3 F .. Good quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 3 L.

C 4 L .. Fair quality cutters in Lemon colour.
Smooth, fair texture, lean, ripe, thin body, normal strength, normal width, true colour shade, normal finish, unmingled. Tolerance: 20 per cent. injury and 20 per cent. lugs of the quality of X 2 or better.

C 4 F .. Fair quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 4 L.

C 5 L .. Low quality cutters in Lemon colour.
Fairly smooth, lean, fairly ripe, thin body, not tender, normal width, fairly true colour shade, normal to dull finish, unmixed. Tolerance: 20 per cent. injury and 30 per cent. lugs of a quality of X 3 or better.

C 5 F .. Low quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 5 L.

LUG GRADES (X GROUP).

General Specifications.—All grades of the X group must be clean, sound, and must not exceed the tolerance specified with respect to dead and trashy leaves.

U S Grade — Grade Description, Specification, and Tolerance.

X 1 L .. Choice quality cutting lugs in Lemon colour.
Smooth, fairly oily, thoroughly ripe, thin to medium body, grainy, very open weave, true colour shade, fairly clear finish, fairly uniform. Tolerance: 5 per cent. of dead and trashy leaves.

X 1 F .. Choice quality cutting lugs in Orange colour.
Medium body; otherwise same as X 1 L.

X 1 R .. Choice quality leafy lugs in Red or Mahogany colour.
Oily, medium to heavy body; otherwise same as X 1 L.

X 2 L .. Fine quality cutting lugs in Lemon colour.
Fairly smooth, thoroughly ripe, thin to medium body, fairly grainy, open weave, fairly true colour shade, normal finish, unmingled. Tolerance: 10 per cent. of dead and trashy leaves.

X 2 F .. Fine quality cutting lugs in Orange colour.
Medium body; otherwise same as X 2 L.

X 2 R .. Fine quality leafy lugs in Red or Mahogany colour.
Oily, medium to heavy body; otherwise same as X 2 L.

X 3 L .. Good quality cutting or granulating lugs in Lemon colour.
Unrough, ripe, thin to medium body, fairly grainy, fairly open weave, fairly dusky colour shade, dull finish, unmixed. Tolerance: 20 per cent. of dead and trashy leaves.

X 3 F .. Good quality cutting or granulating lugs in Orange colour.
Medium body; otherwise same X 3 L.

X 3 R ..	Good quality leafy lugs in Red or Mahogany colour. Fairly oily, medium to heavy body; otherwise same as X 3 L.
X 3 G ..	Good quality lugs in Green colour. Quality of X 3, except maturity.
X 4 L ..	Fair quality granulating lugs in Lemon colour. Fairly ripe, thin to medium body, dusky colour shade, cloudy finish. Tolerance: 40 per cent. dead and trashy leaves.
X 4 F ..	Fair quality granulating lugs in Orange colour. Medium body; otherwise same as X 4 L.
X 4 R ..	Fair quality leafy lugs in Red or Mahogany colour. Medium to heavy body; otherwise same as X 4 L.
X 4 G ..	Fair quality granulating lugs in Green colour. Quality of X 4, except maturity.
X 5 L ..	Common quality granulating lugs in Lemon colour. Thin to medium body, dark colour shade, dingy finish. Tolerance: 60 per cent. dead and trashy leaves.
X 5 F ..	Common quality granulating lugs in Orange colour. Medium body; otherwise same as X 5 L.
X 5 R ..	Common quality leafy lugs in Red or Mahogany colour. Medium to heavy body; otherwise same as X 5 L.
X 5 G ..	Common quality lugs in Green colour. Quality of X 5, except maturity.

NONDESCRIPT AND SCRAP (N. AND S. GROUPS).

N. *Nondescript,* as defined.

S. *Scrap* as defined.

A careful study of the specifications of the United States standard grades for flue-cured tobacco is calculated to prove most informative to the Queensland grower, as will also the elements of quality involved therein.

It will be noted in each case colour deepens with increase of body; also, the quality of such colour in the degree of finish is influenced by departure from full ripeness and the efficiency of harvest, cure, and bulking.

Throughout this article the necessity for full ripeness at harvest is stressed. Attention is also drawn to the depreciation of the product that is liable to occur from careless handling (bruising and breakage) in the various stages from picking to arrival on the selling floor, as well as to faults in curing.

It should be understood the grade marks in America are not placed on the tobacco by the grower, but by the officials of the United States grading service after careful examination of the lots prior to their offer for sale, usually by auction.

Should a standard of grades be adopted for Queensland or Australia the marking of such grades would no doubt be effected by a grading service similar to that of the United States of America.

Home Grading.

Whether a standard of grades was adopted or not, the grading of leaf on the farm would be necessary for economic production. At all times the grading of leaf on the farm has been advocated by the Queensland Department of Agriculture, since not only does it result in a lessened cost of production but tends to improve the growers' knowledge

of leaf quality and indicate directions for improvement. Those growers who have classified their leaf and marketed it direct have found it decidedly profitable and in most instances have received approval from buyers. Many have stated their average price for home graded was appreciably in advance of that received when the leaf was sent to a proprietary grading concern, and that the amount of scrap or damaged leaf was much less.

A deterrent to home grading in most instances is lack of confidence on the growers' part and the idea that the time occupied therein cannot be spared from other farm operations. By adopting a system in bulking down after each cure, grading will be much simplified and the time occupied therein greatly lessened.

As remarked previously, leaves ordinarily increase in body from the bottom to the middle of the plant, and decrease from there to the top. When the stand of plants is even in growth to maturity each picking will be of leaves occupying practically the same position on the respective plants. They will thus be of more or less even size and texture, differing slightly in quality and colour. In other words they will agree with one or other group.

It has been recommended to bulk down each cure on the sticks on removal from the curing barn (*see* under "Conditioning" in "Tobacco Growing in Queensland"). This will, of course, necessitate a double lot of sticks to allow of the barn being immediately filled again. On the sticks the leaf will come into more even condition, and allow greater ease of handling. During the following cure ample time will be available to take the leaf from the sticks and to roughly grade it into, say, three grades, such as Bright, Medium Bright, and Green (if any). At the same time leaf of another group which on some plants may have been ripe at the time could be separated and added to its proper bulk. Bulks can thus be built up representing the respective pickings from all the plants in the crop. Each would then very largely conform to one of the groups as Lugs, Wrappers, Leaf, or Cutters.

When attention was given to grading for market each bulk would yield leaf in which size, body, texture, and quality as well as colour would be fairly uniform. The number of grades from a bulk would therefore be confined to three or four, or at most five, according to colour and injury rather than to difference in group or quality. Where, as is frequently the case, pickings from all parts of the plants are included in one or two bulks difficulty is experienced, as leaves differing in body, size, quality, and colour are encountered, necessitating upward of a dozen receptacles for the different grades. It is obvious that the leaf in systematic bulking will be graded with much greater speed and accuracy.

It must not be supposed that leaf of each group will be found in quantity in every crop. Soils and seasons, as well as the cultural methods employed, influence quality in tobacco.

Any standard of grades must necessarily provide a large number to allow accurate classification of leaf from crops grown on light to heavy soils and in favourable to unfavourable seasons.

The number of grades to be found in any one crop will be comparatively few in any season, though their quality will be accordingly varied.

In home grading, where the soil on which the crop is grown is fairly uniform, the average pick of three ripe leaves will conform to the requirements of one or other of the grades mentioned, when size of leaf and amount of body are considered.

Colour.—It will be noted in the instructions for grading in "Tobacco Growing in Queensland" that colours are described as Lemon, Bright Mahogany, Mahogany, Dark, and Green. In the American standard Orange is used in place of Bright Mahogany.

At the present time when leaf is offered for sale either on the farm or on an auctioneer's selling floor, buyers insist that it shall be graded into hands and packed ready for transport. The packages are opened and two or more hands extracted. The quality of these hands on examination decides the offer.

As the package bears the grower's name and district as well as its weight and a distinguishing number, it is identifiable at the factory with the buyer's returns. When unpacked there for reconditioning or manufacture the accuracy of grading and the agreement or otherwise of quality of sample to bulk is noted. Such information is no doubt passed on to the buyer who is accordingly guided in his offers of purchase on the next occasion. The grower will thus become known as dependable or otherwise in his grading. A reputation for care in grading can be calculated to influence a possible improvement in offers of purchase just as one for carelessness would suggest a decline.

As mentioned previously, where the soil of the tobacco field is more or less uniform the grading of leaf therefrom will not present much difficulty, especially when systematically bulked.

Size of leaf, body, and texture will largely agree in each bulk, allowing attention to be mainly directed to assortment according to colour, blemish, and injury.

The accidental inclusion in the bulk of leaf of another group will be at once seen, while a definite change of body will be noticed when handling. Such leaves will be few in number and can be set aside for later attention. Leaves with broken stems or midrib should not be included with whole leaf but classed as scrap. As labour during manufacture is increased in the operation of stemming, their inclusion will invariably result in the lowering of offers of purchase.

A well lighted room is absolutely necessary to permit of satisfactory grading as well as a good sense of colour on the part of the assorter.

The atmosphere in this room should carry a degree of humidity sufficient to disallow the drying of leaf during grading and handing. A dry atmosphere, such as obtains when westerly winds prevail, can be corrected by damping the floor or suspending wet bags in positions where contact with the tobacco is not possible.

When the leaf in the bulk is so dry that it cannot be properly examined without danger of breakage it will be necessary to bring it into sufficient condition to permit of ready handling.

A room in which humidity can be controlled fitted with racks to carry shallow trays with wire-netted bottoms to hold leaf so that the humidified air will readily circulate through it, is of great advantage in so doing. By a gradual absorption of moisture in this manner a satisfactory condition is most easily secured.

A more expeditious though less attractive method is to admit steam at a very low pressure to the bottom of a box or similar receptacle at least 2 feet in height, the bottom, sides, and ends of which are close-boarded and the top covered with wire-netting. The leaf is placed on this and carefully separated so that contact is made with the vapour arising until it becomes sufficiently limp. Care is necessary with this method to prevent over conditioning by which colour would be depreciated.

Sizing.—The size of a leaf is denoted by its length and breadth. Varieties differ in the relation of one to the other, but not to a remarkable extent in those at present commonly grown in the State for flue-curing. As the leaf grown on the farm will usually be the product of one variety length can be taken to determine size.

In such leaf the qualities of flatness, texture, smoothness, porosity, solidity, body, strength, elasticity, &c., will generally agree with the lengths, except in the case of primings or sand lugs, where departures therefrom are pronounced.

Where more than one variety is grown and there is great disparity in the width of leaves of equal length separate grades are advisable.

Lengths.—Should a standard of grades be adopted for the State is is probable a standard of tobacco sizes therewith would also be determined. Until such, however, has been consummated, the following sizes, with a range of four inches between longest and shortest therein, are suggested:—

Under 8 inches (class as scrap)
8 inches to 12 inches
12 inches to 16 inches
16 inches to 20 inches
20 inches to 24 inches
24 inches to 28 inches
28 inches and over

The lengths given are approximate. A tolerance for leaves slightly under or over the lengths stated will no doubt be permitted. All the sizes are unlikely to be found in any one crop; they will usually be limited to three or four.

Body.—The body or thickness of the leaf discernible when handling will generally agree with the size. When it does not, as with primings or sand lugs, which are very thin, the difference is sufficiently pronounced to allow of easy separation.

Apart from primings a definite change in body according to size of leaf may be due to growth in a distinctly different type of soil from that general in the field, such as a small area where clay comes close to the surface. Leaf from diseased plants or those affected with nematodes will also vary in body as well as in quality.

Where such leaf is in insufficient quantity to form separate lots for market it can be included in the nearest grades, where a certain tolerance will be allowed. Usually, however, such leaf is of inferior quality to the run of the lot, and will find a place in the lower grades.

Colour.—The colour of leaf, when the shade is light or true and the finish bright or clear, is regarded as a special quality in manu-

facture. Otherwise it is an indication of quality as regards maturity and the efficiency of cure.

As body usually agrees with size, in which many of the elements of quality concur, the value of classification according to colour will be realised.

Injury.—The amount should be calculated as the percentage of the leaf thereby depreciated. Breakage of leaf, otherwise uninjured, does not necessarily lower its smoking quality. A slight fracture of the leaf blade without loss can be disregarded. Broken stems, however, are definitely regarded as injury, as they increase the cost of manufacture. Allow 5 per cent. of injury for each break. Injury, otherwise, will be calculated as the approximate percentage of the usable part of the leaf which is lost or depreciated in value through various agencies—see definition of injury or damage.

Grades are suggested showing, respectively, 5 per cent., 10 per cent., 20 per cent., 30 per cent., 40 per cent., and over 40 per cent.

Wholly dead and trashy leaves which cannot be conditioned should be discarded.

[TO BE CONTINUED.]

TO MEND TANKS AND TROUGHS.

Miss Barbara McGovern, of Waterloo, Longreach, supplies this practical hint:—To mend tanks or troughs that have pinholes rusted through, fill a kerosene tin with cold water. Throw in washing soda until the saturation point is exceeded and undissolved soda can be seen lying on the bottom of the tin. Next get a flat vessel, such as an old baking dish, and mix cement with this water until it becomes a thick paste (make only a small quantity of cement at a time, as it sets very quickly). Apply this paste thickly to the holes with a brush, spreading some around them also. Moisten and wring out a piece of strong unbleached calico and press it down on the cement firmly and smoothly, as if sticking paper on a wall. Put another coat of cement paste on this, then apply another strip of calico, and a final coat of cement will finish the job. Two people are needed to make it a success—one to mix the plaster, and one to do the work. The man mixing the cement must keep briskly stirring and mixing the paste, turning it over with a small trowel till all is used. Water should be shut off the tank for twelve hours. The patch will then have set hard and will not crack when the tank expands or peel off when dry. Sheep troughs stand for years after this treatment, and a tank made of flat galvanised iron was successfully treated while full of water. No soda was available on one selection, and waterglass was used to mix the cement, and used while the tank was full of water. During this present drought the scarcity of water is a very serious matter, and all old tanks, carbide drums, or anything that will hold water is called into commission, and a job has to be done in a hurry, with no plumber available. Selectors on the Thompson River are carting water for household and stock use for many miles, and as the water is rapidly disappearing, it has to be stored as much as possoble.

The Pig Farm.

ACCOMMODATION AND EQUIPMENT.

(*Revised.*)

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

IN providing accommodation for his pigs, the farmer must consider the health and comfort of his stock and plan to prevent disease as far as practicable; he must also consider his system of feeding and management and bear in mind the class of pigs that is required by the pork and bacon trades.

During recent years the general demand has changed towards leaner meat, and pig-raisers are now endeavouring to produce pork and bacon pigs which have an abundance of lean meat and a minimum of fat; this, of course, necessitates a change of methods in breeding, feeding, and management.

Investigations into disease in pigs have shown that certain rules in sanitation regarding pig accommodation will, if carried out, control most of the serious troubles which occur in pigs, particularly infestation by internal parasites.

PLATE 188.

Berkshire sows being kept economically on lucerne. Their movable shelter shed may be seen in the background.

Although certain features must be considered for the pig's health and comfort, one must also consider the cost of providing pig accommodation, for pig-raising is a business, and if too much capital is expended on the insurance of health of the stock, the additional income may not give sufficient return on the capital invested. Fortunately, under the mild climatic conditions which prevail in Queensland, ample accommodation may be provided for pigs at a comparatively low cost and the outlay on good piggery equipment is usually well repaid.

The class of accommodation required for any piggery depends upon the system of pig-raising to be carried out. There are several fairly well-defined systems in Queensland. The coastal dairy farmer who keeps pigs to utilise separated milk usually has very little cultivation and rarely grows grain, depending on the separated milk, perhaps some sweet

potatoes and arrowroot, together with some pasture, to feed his pigs. Under these conditions the pigs are usually kept fairly convenient to the dairy to reduce the labour required in conveying milk to the pigs, and, if practicable, the pigs are fed at a place lower than the dairy, the milk being conveyed from the separator room to the piggery by means of an open gutter pipe. On this class of farm pigs are usually given access to grazing on permanent pastures.

The mixed farmer who combines dairying with crop-growing keeps pigs to use his milk by-products and a portion of his grain, root crops, lucerne, and pumpkins. He studies the market prices of pigs and of the various crops to determine when to market his crops direct and when to sell them by way of the pigs. Under these conditions more pigs are kept per cow than where milk is the main source of food supply. The pig accommodation on this type of farm should be such that the pigs can be turned on to portions of the cultivation land to enable them to harvest some of their own food when desired.

Pig-raisers who do not use milk, but substitute meat meal in the pig's ration and grow grain, lucerne, and other crops especially for pigs, have a different proposition again and should aim at having all their paddocks suitable for holding pigs.

PLATE 189.
These prime baconers were "finished" under paddock conditions, never having been penned.

Pig farmers who run large numbers of pigs on small areas of land adjacent to cities or towns or near dairy factories, and feed their pigs on table refuse or factory by-products, usually keep their pigs on a different system to farmers who have fairly large farms and produce most of their pig food.

Bearing in mind the most important feature of pig accommodation —namely, sanitation—there can be only two clearly-defined systems of keeping pigs which are completely satisfactory; one is the grazing system, wherein pigs are kept on fresh pasture or crop land which is

either rested or cultivated and grazed in rotation; the other is the intensive system in which the pigs are kept on impervious floors, such as concrete, which are properly drained and regularly cleansed. In both of these systems the object should be to keep the pigs on clean ground or on a clean floor, for a good deal of the infection to which pigs are subject lurks on the ground or floor of pig pens which are not rested or are inconvenient to cleanse.

Where there is a sufficient area of good grazing land or cultivation land the grazing system has many advantages, and should be adopted either entirely or in combination with the intensive system, which is often convenient for sows with young litters of pigs. If sufficient paddocks can be cropped for the pigs to do the harvesting, the paddocks being ploughed a couple of times each year, infection will be kept at a minimum, the pigs will receive benefit from the exercise gained in grazing or harvesting their own food, a good deal of labour is saved in the harvesting of the crop, and the fertility of the land benefits.

PLATE 190.

Intensive pig pens in use at the Animal Health Station, Yeerongpilly.

On grazing land where cultivation is not practicable it is necessary to have sufficient paddocks of ample area to keep them always well grassed and to enable the resting of the paddocks at frequent intervals. Pig paddocks should not be over-stocked so that they become bare, unless they can be cultivated or rested for several months. Even if pigs are paddocked as suggested, the ground near the troughs will become "pig sick" after a time, and it is most desirable that such equipment should be movable. Sheds of convenient size—say, with a floor space of 8 ft. square—should be provided in the paddocks to shelter the pigs from the extremes of the weather, and these sheds should be built on skids to allow of their easy transport about the paddock or from one

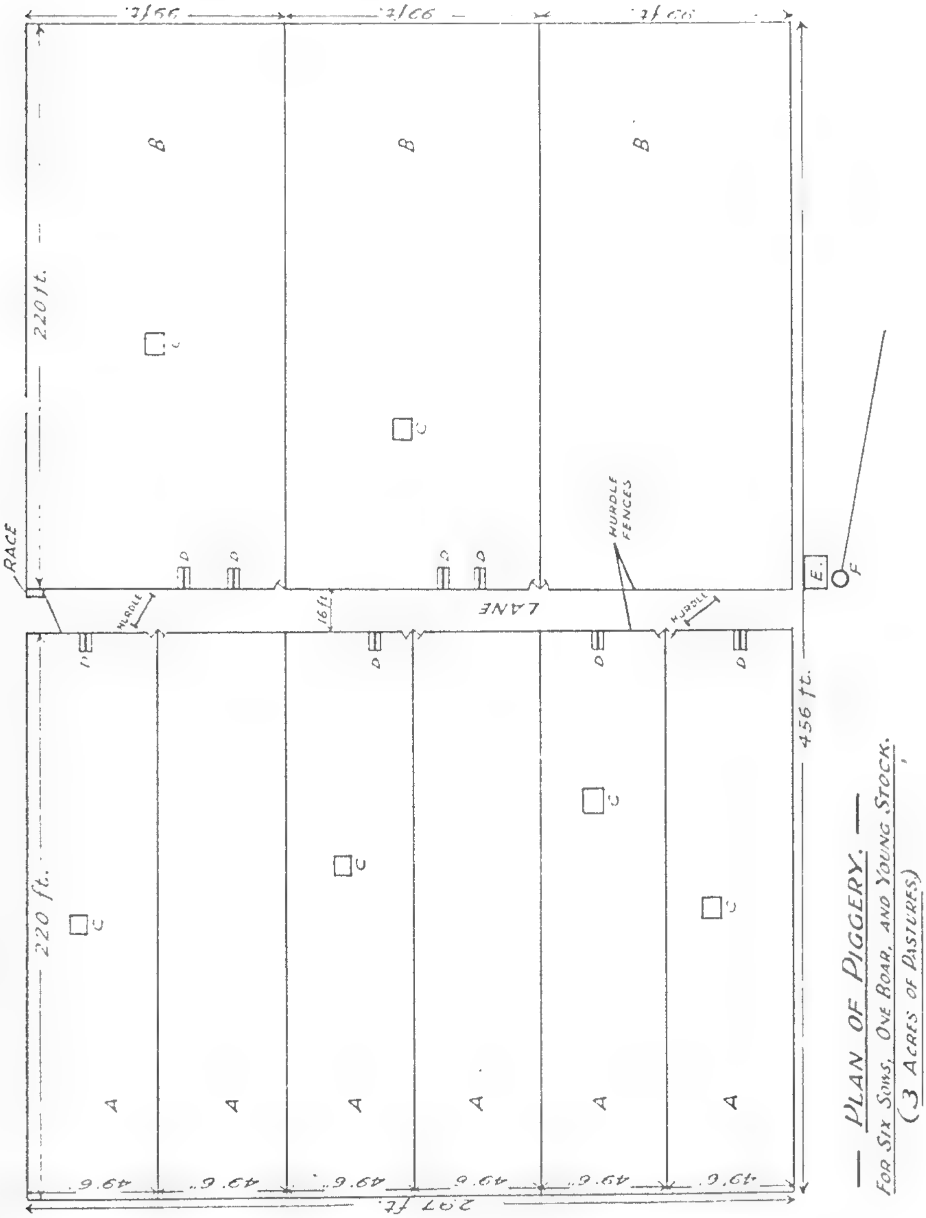


PLATE 191.

(*a*) Indicates paddocks of ¼ acre each for the use of dry sows, sows with litters, and the boar. At most times two of these paddocks could be under cultivation and later be grazed in rotation.

(*b*) Indicates paddocks of ½ acre each in extent to be used for growing pigs. As one paddock could usually be spared they can be cultivated and grazed in rotation.

Six movable sheds (*c*) should be sufficient shelter for the pigs, as these may be moved from one paddock to another as required.

Troughs built on movable platforms (*d*) will be found convenient if drawn against the fence and moved along as the surrounding ground becomes fouled.

(*e*) Shows the feed shed.

(*f*) Shows the milk tank connected by a line of fluming from the separator-room.

paddock to another. Food troughs and platforms, self-feeders, and water fountains should also be mounted on skids for easy transport.

With movable equipment and sufficient paddocks, there is no necessity for cleaning up with broom and shovel, and where pigs are kept on the grazing system the whole piggery is found to be free of noxious odours which are usually associated with small pen piggeries; these features make pig-raising a much more congenial undertaking when the grazing system is adopted.

When the intensive system of pig-raising is adopted, impervious floors and good drains are essential; a good supply of water and labour is also required to clean the pens daily. Intensive pens are necessarily small, and a portion of each pen is roofed to provide the pigs with shelter from the extremes of the weather. (*See* plan of intensive pig pens.)

A Suggested Layout.

The plan of a piggery shown in Plate 191 suggests a layout which has proved very satisfactory where suitable cultivation or grazing land is available. This plan gives scope for cultivation and rotational grazing of paddocks with a view to providing a maximum of pasture for the pigs and control of disease and parasites. The lane in the centre of the runs with a loading race at one end and two movable hurdles provides ample facilities for drafting pigs.

PLATE 192.

A section of a paddock piggery on Mr. W. F. Kajewski's property at Glencoe, showing the laneway, portions of paddocks, and movable shelter sheds. The long narrow paddocks are cropped regularly, and the system has been working satisfactorily for some years.

The usual fencing should be replaced by movable hurdles at the ends of the runs adjoining the lane, so that when paddocks are being cultivated implements may work right to the end of the run, for it is this portion around the troughs which becomes most fouled.

It is not suggested that the pigs will obtain all their food from the 3 acres of grazing shown in the plan, and the grazing can only be

expected to carry the pigs if other food, such as grain and milk or grain and meat meal, are provided in addition.

Where the correct type of pig is bred and feeding conditions are good, pigs may be kept in paddocks as suggested, from birth to slaughter, with excellent results.

On every farm where pigs are bred and reared a certain number of paddocks or pens are necessary so that pigs of various classes and ages may be kept separately. Breeding sows when dry should be run in a separate enclosure to other pigs, and in some cases it is even desirable to run the forward sows separate from the backward sows. Dry sows will secure the greatest part of their food requirement from good grazing and give best results when kept out in the open.

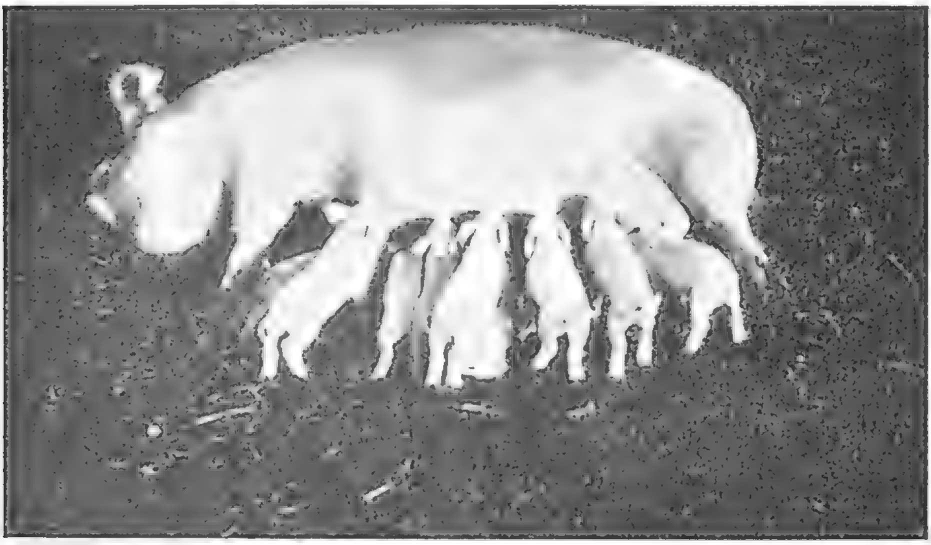


PLATE 193.

This litter of Middle Whites on Mr. H. O. Rees's farm, Maleny, appear to appreciate clean conditions.

The best results are obtained when sows with young litters are kept in individual enclosures, and as it is rather difficult on large piggeries to give each sow and litter a separate paddock large enough to be cultivated, the intensive pen is often resorted to for sows and young litters. However, the sows and litters may be kept separately on pasture by providing each one with a hut to which are affixed three hurdles, making a small run; the whole unit should be movable so that the pigs can be put on to fresh pasture as each patch becomes fouled.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3-in. by 2-in. hardwood, 1-in. water piping, or saplings. It should be placed 9 in. above the floor and 7 in. from the walls.

Individual care is most necessary for sows and litters until the youngsters are about three weeks old, and after that time several sows

with litters of approximately the same age may be run together with good results; however, no other pigs should be run with these. When the pigs are three or four weeks old they may be provided with a self-feeder containing grain or meals; the sows may also be given access to the self-feeder during this latter half of the lactation period, one feeder being sufficient for several sows and litters. When a feeder containing dry foods is provided, there should also be an accessible water supply, even if the pigs are given milk in addition. The young pigs do very well on this system of feeding, and when it is desired to wean them at eight weeks old the self-feeder should be enclosed with hurdles, which enable the young pigs to enter, but exclude the sows. The sow's food supply is so reduced that her milk flow ceases, and at the same time the young pigs take a larger amount of food from the trough, and thus weaning is achieved satisfactorily.

PLATE 194.

The system of pasturing sows and litters in movable huts with three hurdles attached to provide a yard is here illustrated in use at Mr. W. Dawson's farm, Woolooga.

After weaning the sows should be returned to the dry sows' paddock and the weaners should be graded into lots according to size.

From weaning time until marketing the growing pigs should be graded according to size into as many lots as convenient; under the grazing system, provided there is ample trough space to feed the pigs comfortably, two or three lots will be sufficient for the growing pigs; under the intensive system, pigs are usually kept in smaller lots.

Situation.

In selecting a site for intensive pig pens, consideration should be given to the aspect so as to provide shelter from the prevailing winds and to make the best use of the early morning sun as a disinfectant and deodoriser inside the sheds; thus a north-easterly aspect will usually be found the most suitable.

It is an advantage to have the pig paddocks on a slope to provide surface drainage. It is required by the Dairy Produce Act that the piggery should be situated at least 150 ft. from dairy yards and buildings.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

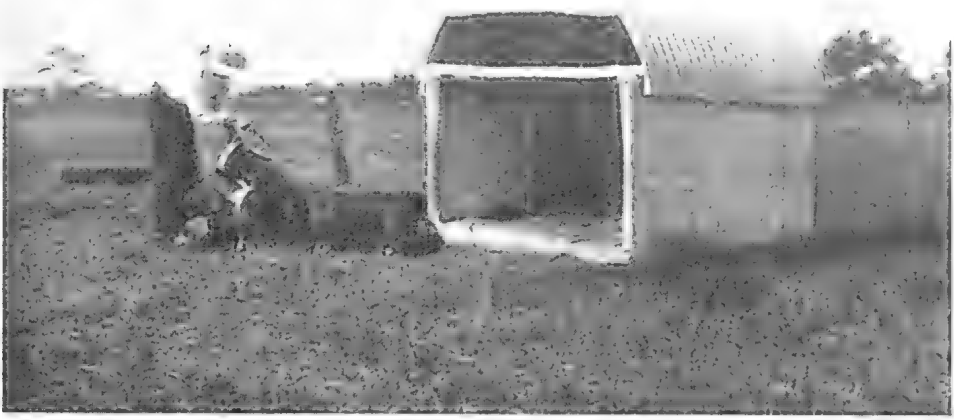


PLATE 195.
A half-tank movable shed in use at the St. Lucia Training Farm.

Legislation.

Pig-raising is controlled by legislation under the Pig Industry Act, Dairy Produce Act, Diseases in Stock Act, and the Slaughtering Act, and the by-laws of city, municipal, and shire councils. While it is advisable, when about to construct or alter a piggery to consult the authorities concerned, through the district inspectors under the Acts, it might be stated here that the general purposes of the legislation in force are to provide for health and sanitation on the premises where pigs are kept. They do not aim at hindering progress or at increasing the cost of production.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against disease.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time. An average space of 10 in. should be allowed for each adult pig. The trough should have the capacity to hold a full feed for the pigs.

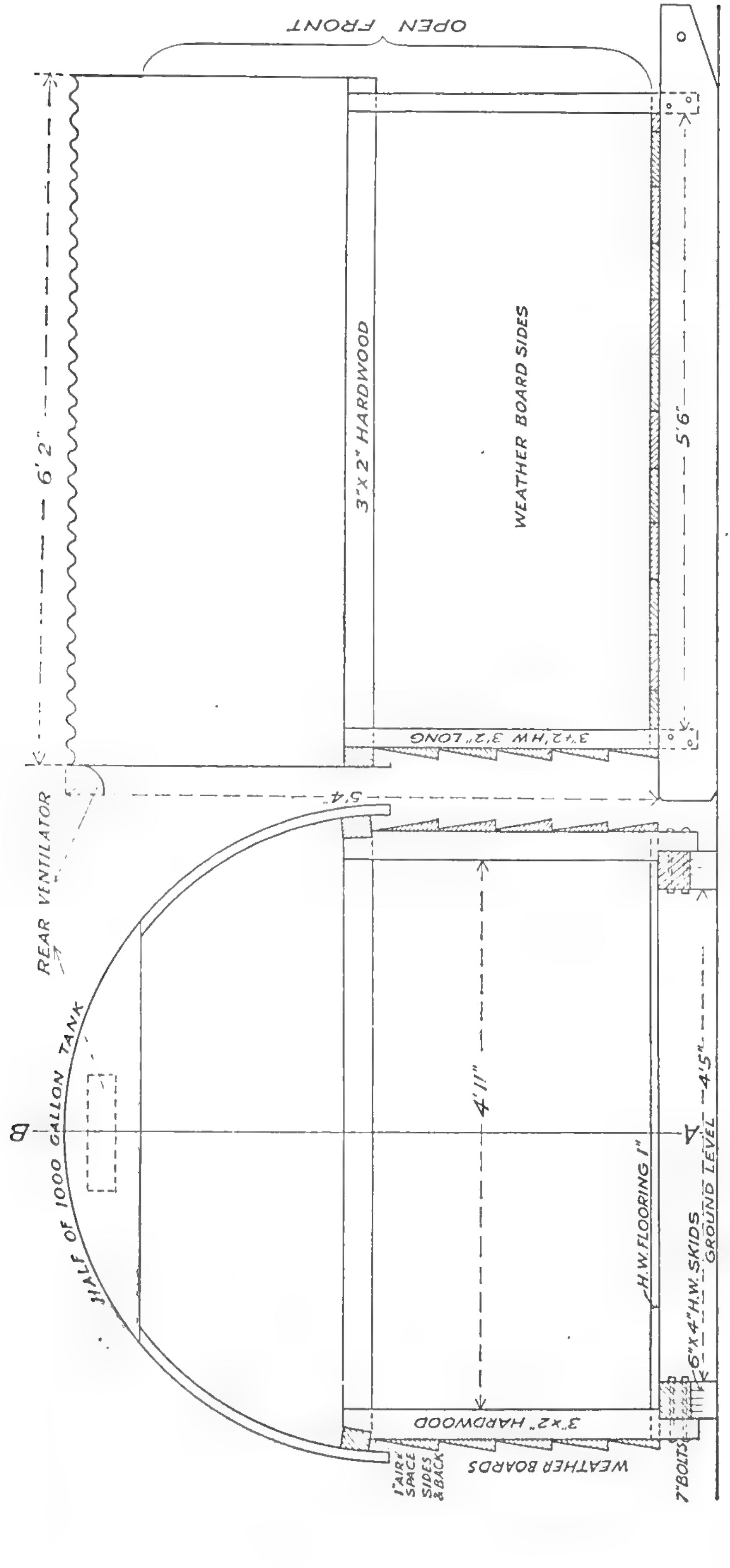


PLATE 196.

Plan of a portable shelter shed, using half a water tank Note skids on which this shed is constructed, providing for ready means of moving the house when required.

PLATE 197.

The fence illustrated consists of "pig netting" of eight horizontals, 30 inches high in all. In addition, a barbed wire has been provided on the ground to prevent rooting, and another 6 inches above the netting to prevent jumping.

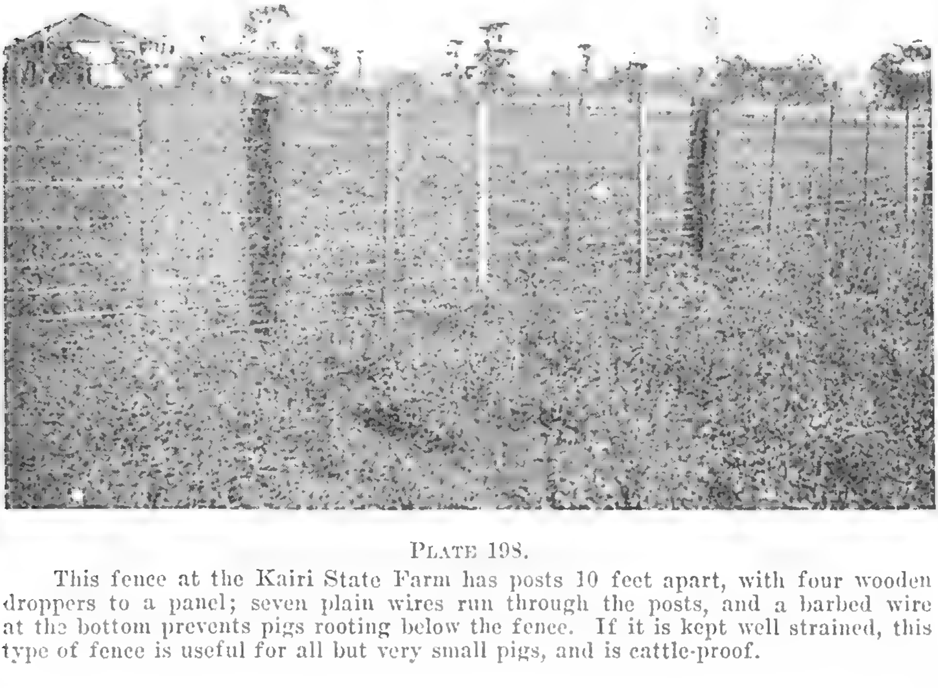


PLATE 198.

This fence at the Kairi State Farm has posts 10 feet apart, with four wooden droppers to a panel; seven plain wires run through the posts, and a barbed wire at the bottom prevents pigs rooting below the fence. If it is kept well strained, this type of fence is useful for all but very small pigs, and is cattle-proof.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made, they should be of a size which allows of their being easily carried or hauled on to clean ground. With stationary troughs it is essential that they should be built on to a floor of concrete, brick, or timber to prevent the pigs from making an objectionable mud wallow beside the trough. The most serviceable troughs are of concrete, built into a concrete floor, as shown in Plate 200.

PLATE 199.

Where palings are readily available they can be used for pig fencing, as shown in this illustration.

The V-shaped wooden trough as illustrated in Plate 201 is very useful as a movable trough. This type of trough can be made of varying sizes to suit requirements. The timber must be tightly fitted to prevent leakages. A dressing of tar inside and out acts as a preservative of the wood and also makes it water-tight and more hygienic. Such a trough built on a movable wooden platform is very convenient for paddock use.

Automatic Waterer.

Plate 202 illustrates a watering device used at the Kairi State Farm piggery. A 40-gallon drum is set into a trough 6 in. deep, and the whole is fixed on to a slide. The drum has a ½-in. plug hole 1½ in. from its bottom, and a larger plug hole for filling at its top. The lower hole allows the water to flow out to a sufficient height to allow of the pigs drinking from the trough; and to fill the drum, the bottom hole is plugged and the top hole opened.

Self-feeding of pigs is as yet little practised in Australia, because pigs are kept chiefly to utilise by-products, such as separated milk, which are not readily adaptable to self-feeding; but when the price ratio of grain and pork is such as to make the pig a profitable means of disposing of grain, pig-raising must be considered from a somewhat different view-point.

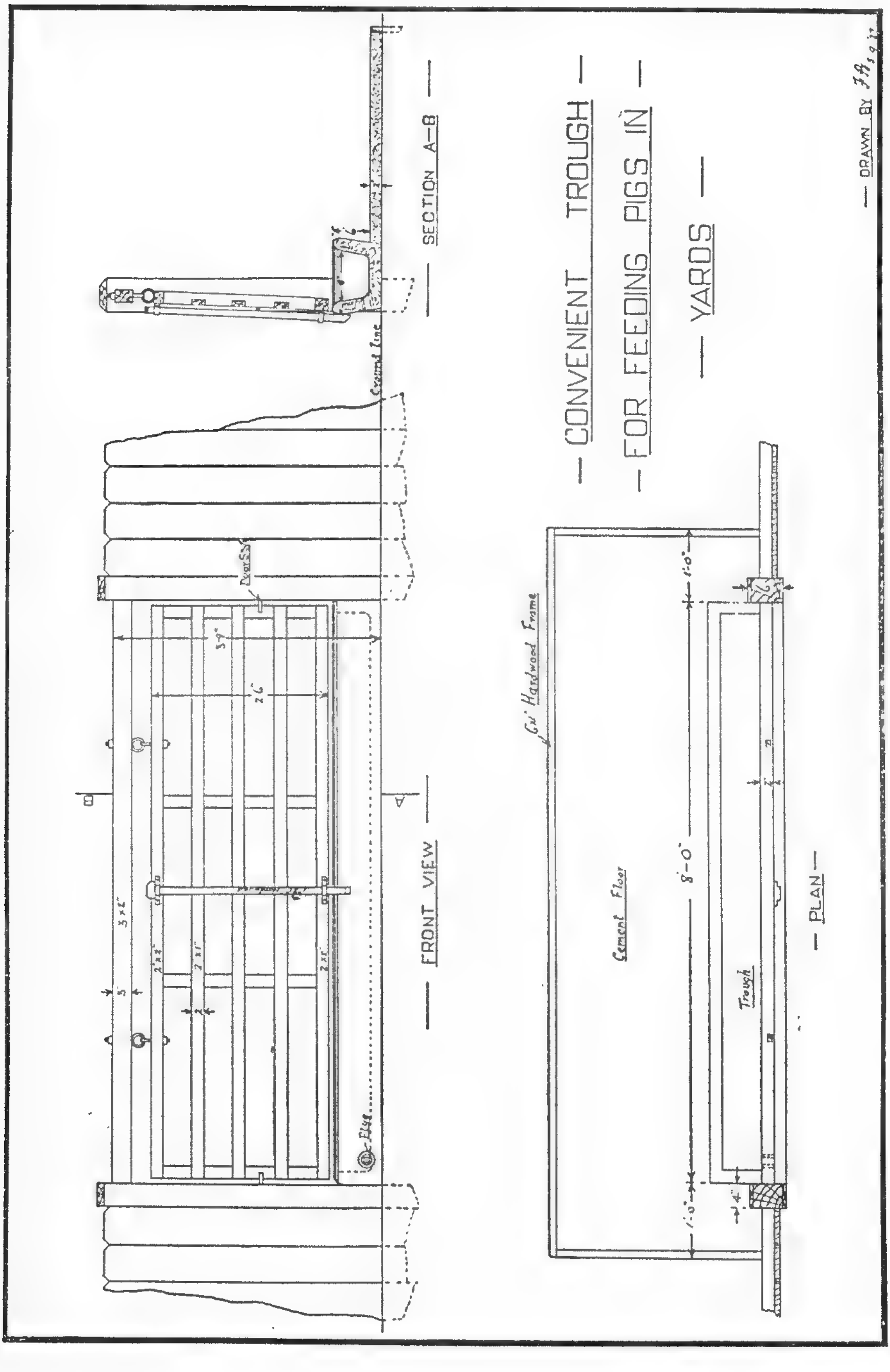

— CONVENIENT TROUGH —
— FOR FEEDING PIGS IN —
— YARDS —
— SECTION A-B —
— FRONT VIEW —
— PLAN —
Cement Floor
Trough
8'-0"
DRAWN BY

PLATE 200.

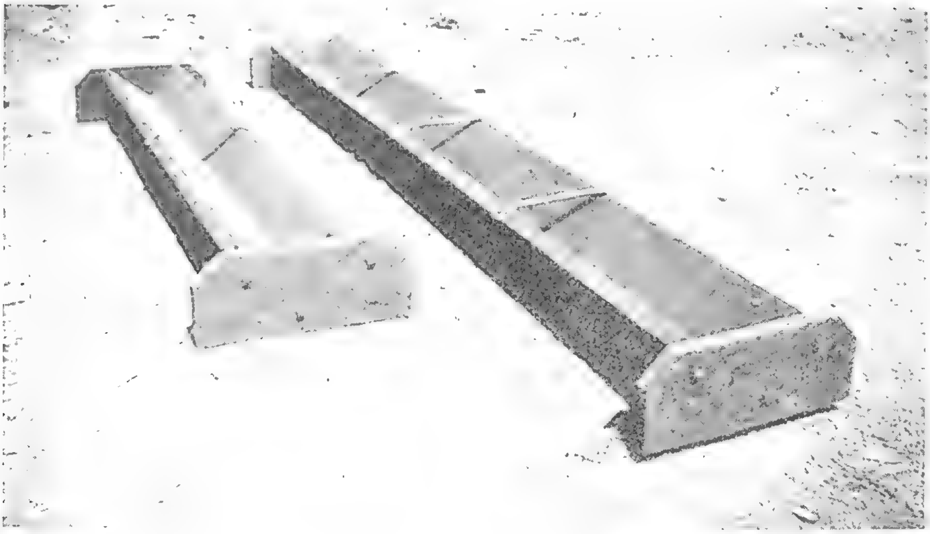


PLATE 201.—Handy V-shaped wooden troughs.

PLATE 202.—Automatic water fountain suitable for pigs in paddocks.

Plate 203 illustrates a type of self-feeder which has given satisfactory results in practice.

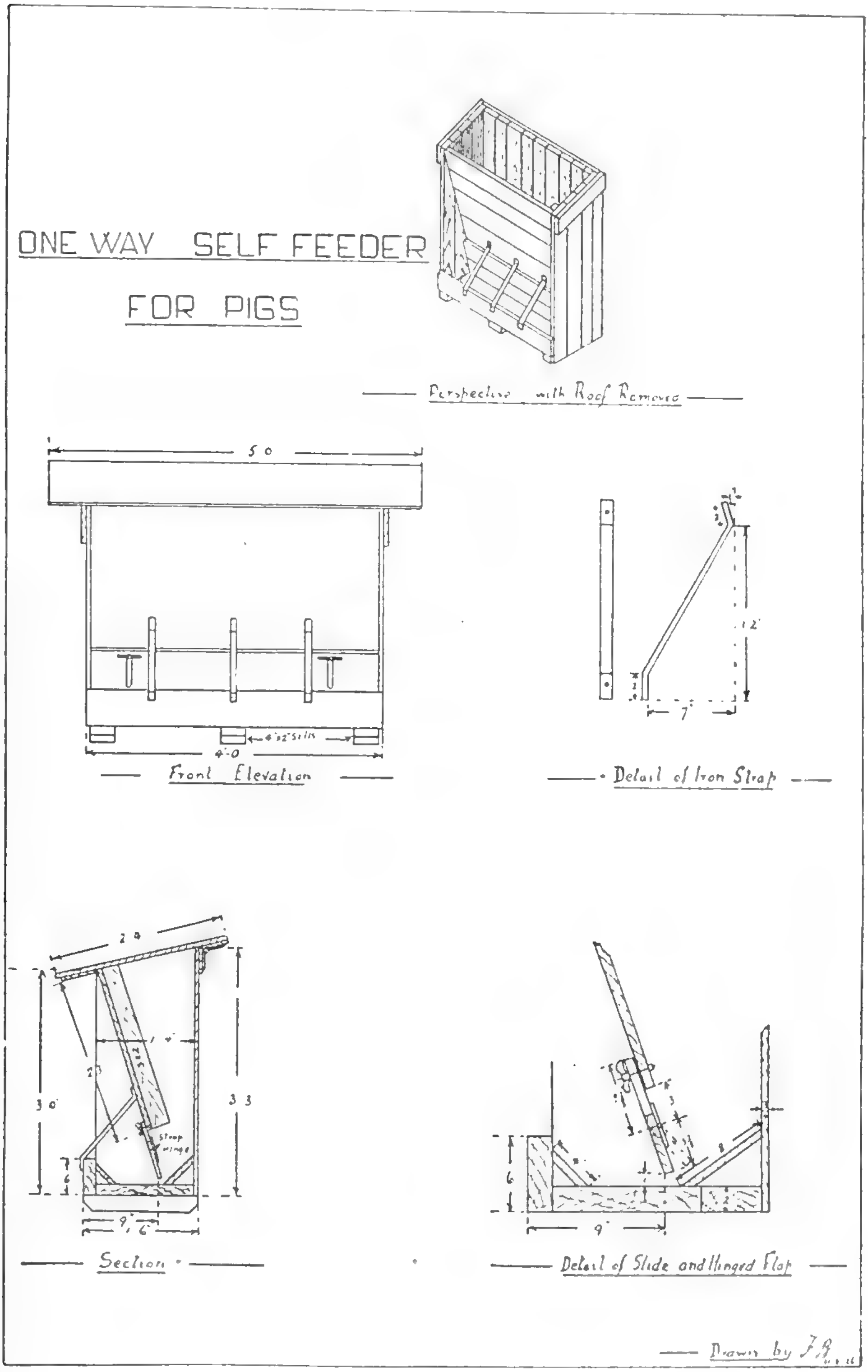


PLATE 203.

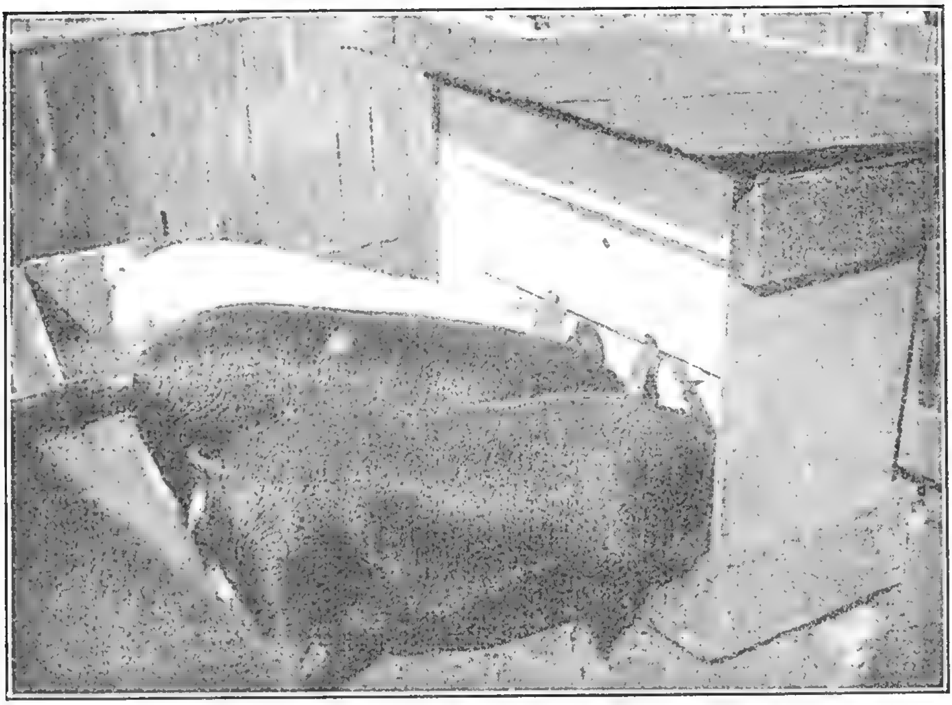


Plate 204.

Baconers grown on the self-feeder, in which was placed a mixture containing 80 lb. maizemeal, 10 lb. lucerne chaff, and 10 lb. meatmeal. The pigs were also given unlimited supplies of drinking water.

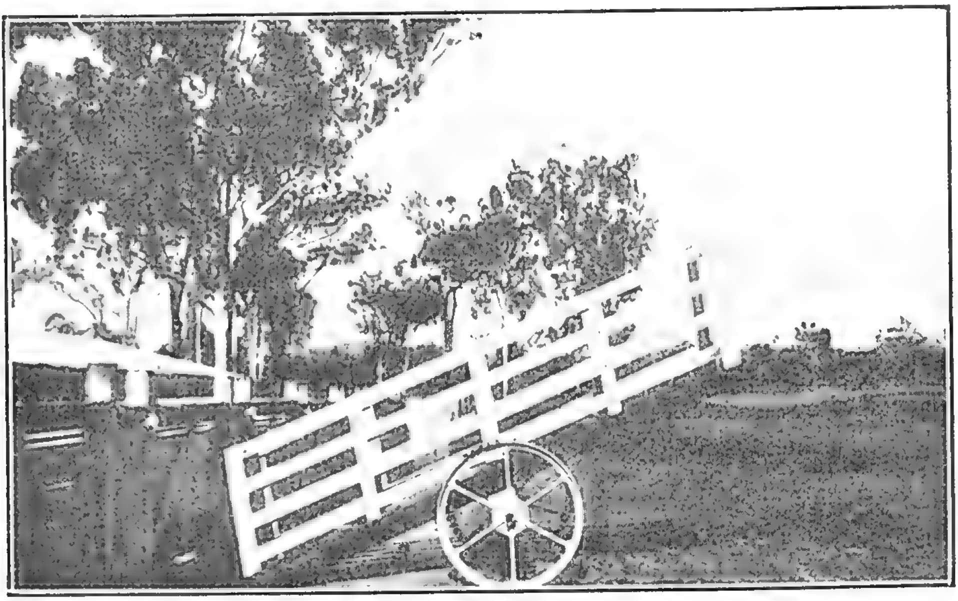


Plate 205.

A useful portable loading race.

The grain-grower who keeps pigs but has no milk foods can make good use of his grain by feeding it in combination with such foods as lucerne chaff and meatmeal, both of which are substitutes for separated milk in the pig's ration. Such feeds as these are adaptable to dry-feeding through a self-feeder, whereby the pigs have several days' food supply placed in the feeder and they are allowed to help themselves. Under certain conditions, self-feeding has many advantages and is worthy of trial.

ONE-WAY SELF-FEEDERS FOR PIGS—MATERIALS REQUIRED.

Members.	Number.	Length. Ft. In.	Size.	Material.
Skids	Three	1 6	4 in. x 2 in.	Hardwood
Trough	One	4 0	6 in. x 2 in.	Pine
Trough	One	3 10½	12 in. x 2 in.	Pine
Trough	One	3 10½	4 in. x 2 in.	Pine
Trough	One	3 10½	8 in. x ¾ in.	Pine
Trough	One	3 10½	4 in. x ¾ in.	Pine
Front Panels	Five	3 10½	6 in. x ¾ in. T. & G.	Pine
Front Panels	Two	2 3	3 in. x 2 in.	Pine
Sliding and hinged flaps	Two	3 10½	4 in. x ¾ in.	Pine
Ends and back	Twenty-four	3 3	6 in. x ¾ in. T. & G.	Pine
Ends and back	One	7 0	6 in. x ¾ in.	Pine
Top	Ten	2 4	6 in. x ¾ in. T. & G.	Pine
Top	Two	5 0	6 in. x ¾ in.	Pine

Hardware—Three 1-inch by ¼-inch iron straps.
Six 3-inch strap hinges.
Two 3-inch by ½-inch bolts with thumb nuts.
Nails, &c.

Shade.

Pigs should be provided with ample cool shade in hot summer months, either by planting shrubs or hedges or by building a framework of 3-in. by 2-in. hardwood and covering the top with bushes or thatching it with grass.

Weighing Pigs.

As pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price per lb. varies according to specified weight limits, it is important to the pig-raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

On account of pig-trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

Even after years of practice, guessing the weights of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, for, with intelligent use, they soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

PLATE 206.

A wooden crate suitable for weighing pigs. Note the strong construction, "slide up" doors at both ends, and wires coming from bottom of crate to be attached to hook of the spring balance. Pine should be used in the construction of the crate so that its weight will not be too great.

PLATE 207.

A good feeding outfit in use on Mr. R. Turpin's pig farm, Lowood.

The weighing crate should be light yet strong; a convenient size for a crate to hold one bacon pig is 3 ft. 6 in. long, 2 ft. 6 in. high, and 1 ft. 6 in. wide.

If the weighing crate is arranged in a race, the pigs can be brought from their pen, weighed, and then returned to the pen conveniently.

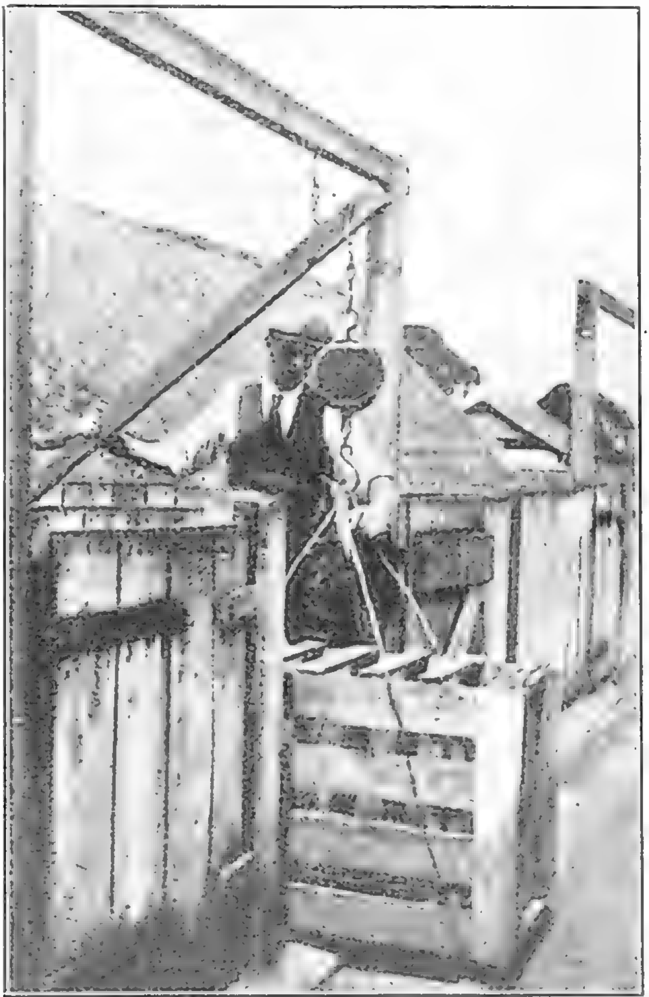


PLATE 208.
Crate in position, ready for use, with front door closed. Note the arrangement of the top beam, lever, and spring balance.

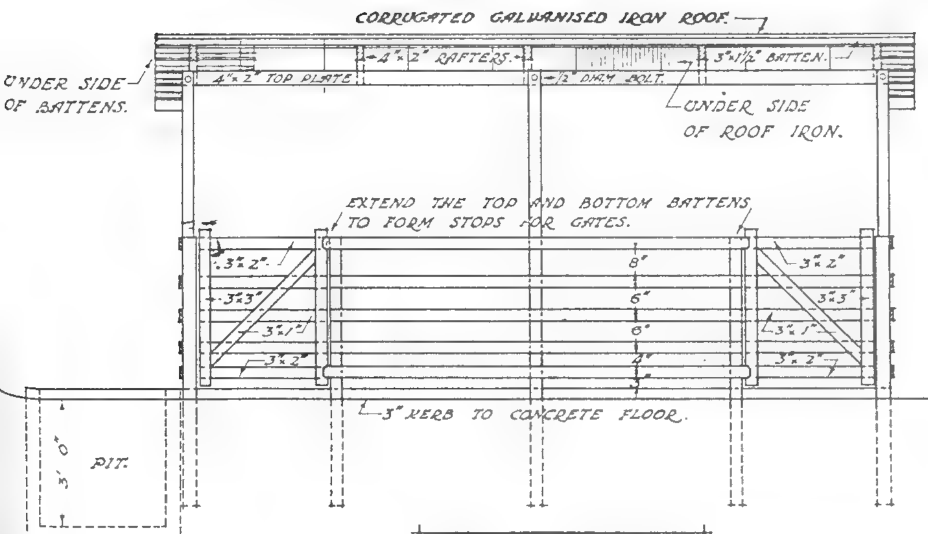
There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig-raisers.

LUCERNE SEED.

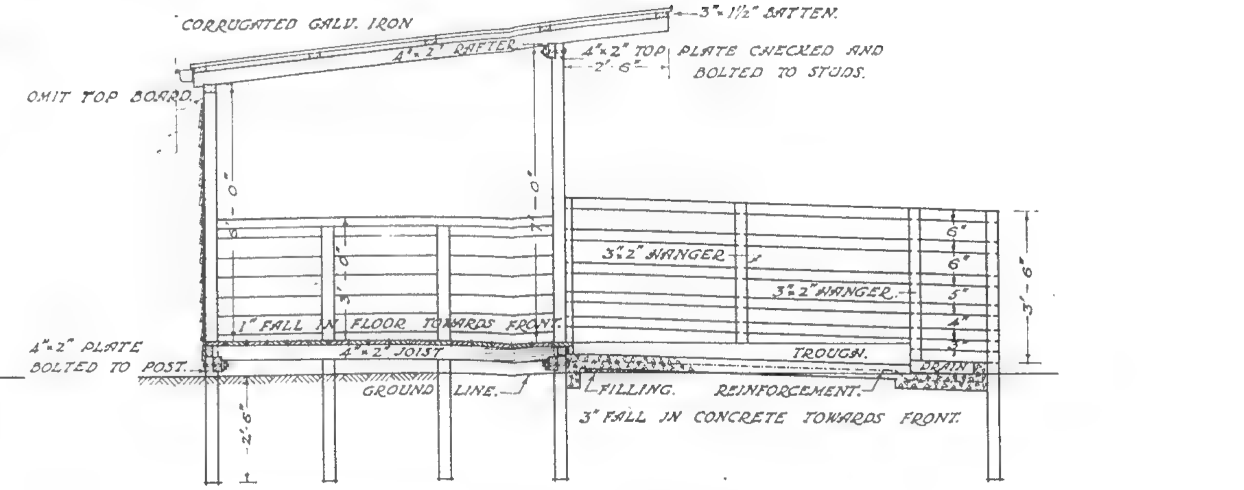
Quantities of lucerne seed that contain a more or less proportion of seeds that are stained red are now upon the Queensland market. This colouring indicates that the bulk in question has been grown outside the Australian Commonwealth.

DEPARTMENT OF AGRICULTURE AND STOCK.
QUEENSLAND.

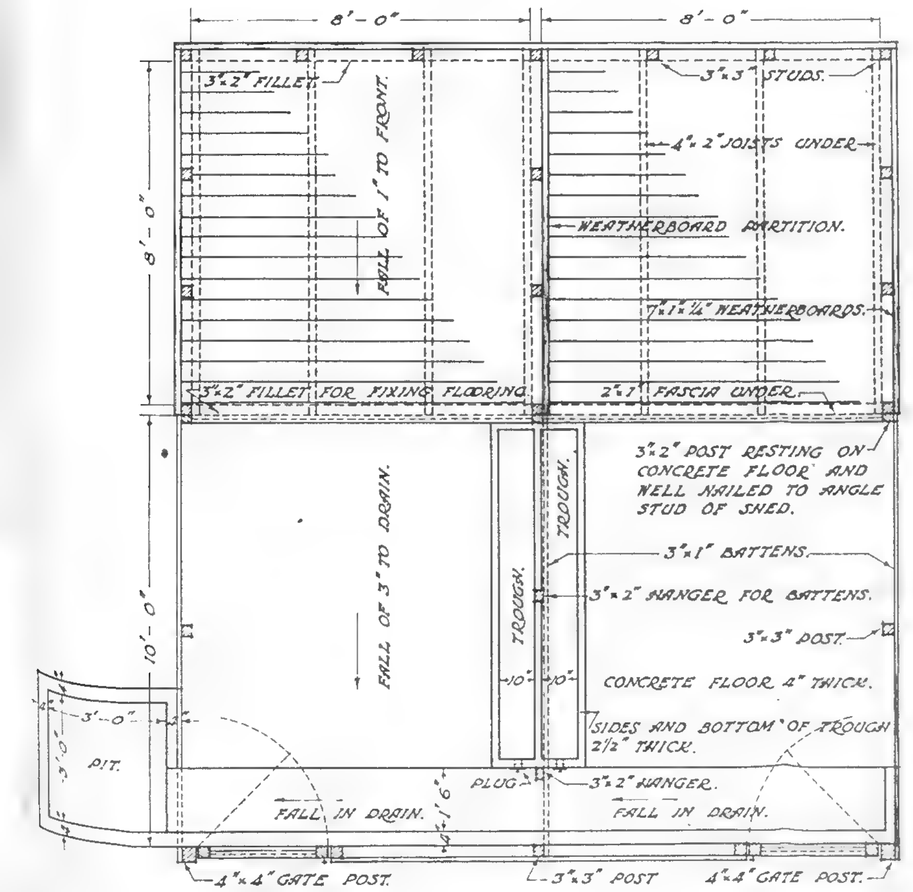
PIG PENS FOR INTENSIVE HOUSING.



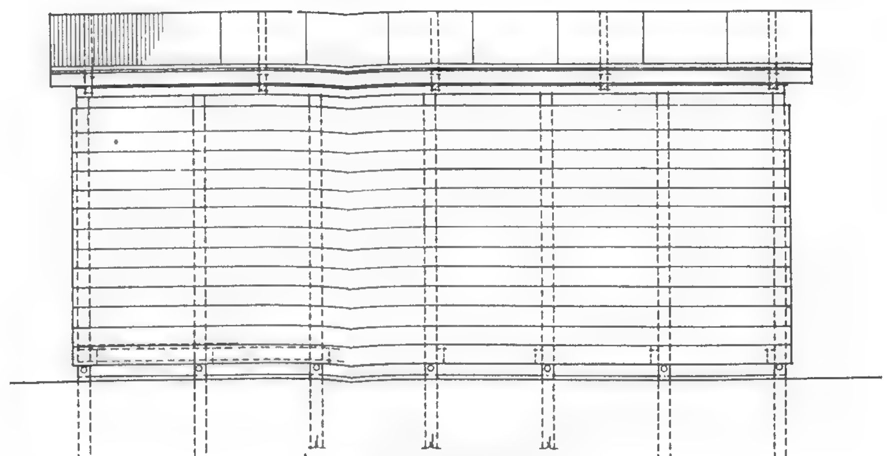
FRONT ELEVATION.



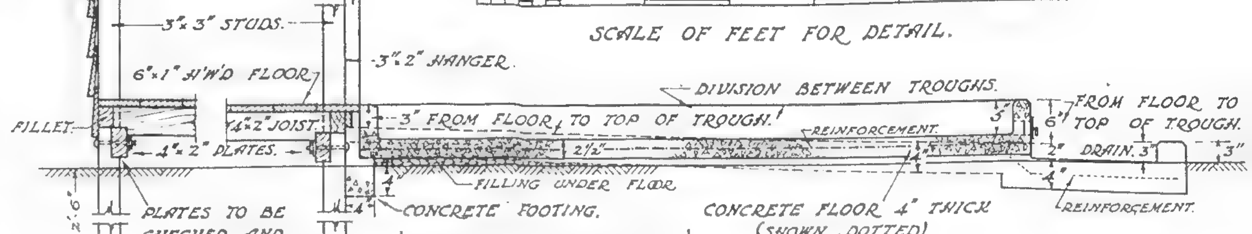
CROSS SECTION.



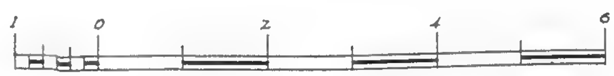
PLAN.



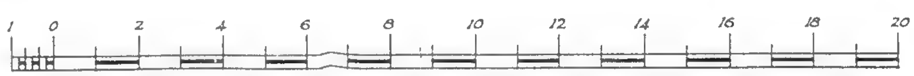
BACK ELEVATION.



DETAIL OF TROUGH &c.

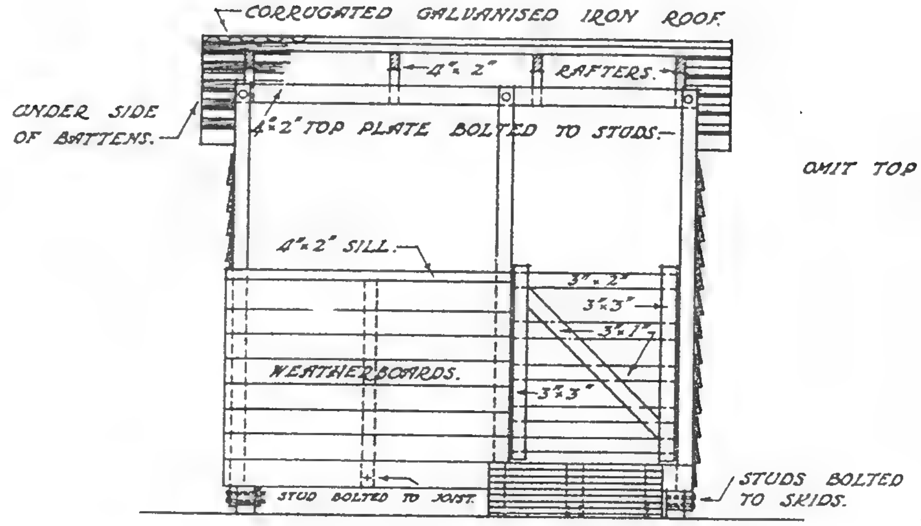


SCALE OF FEET FOR DETAIL.

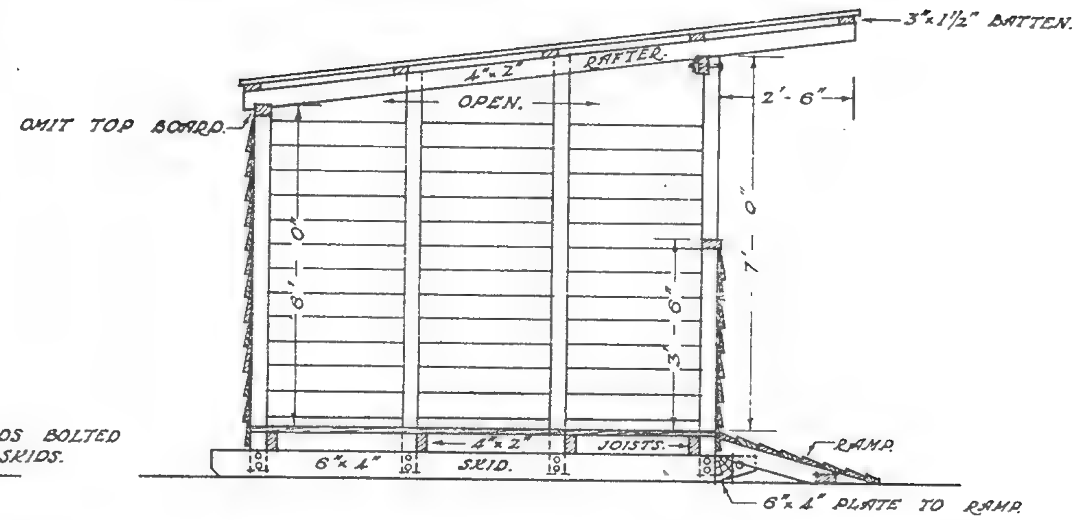


SCALE OF FEET FOR PENS.

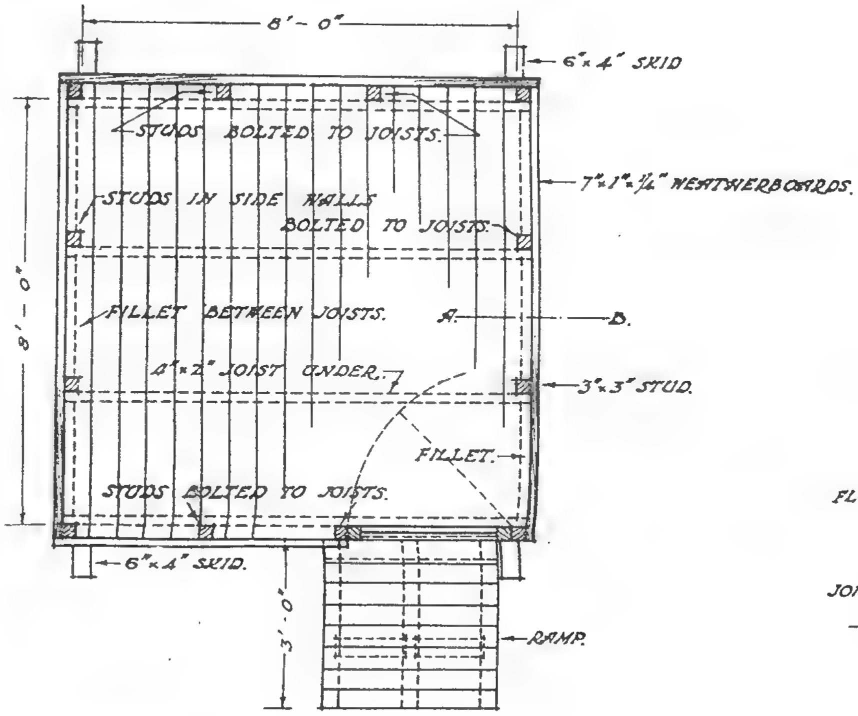
PORTABLE PIG SHED.



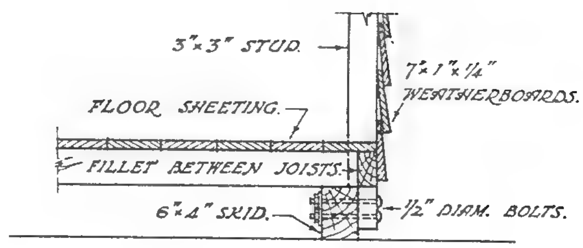
FRONT ELEVATION.



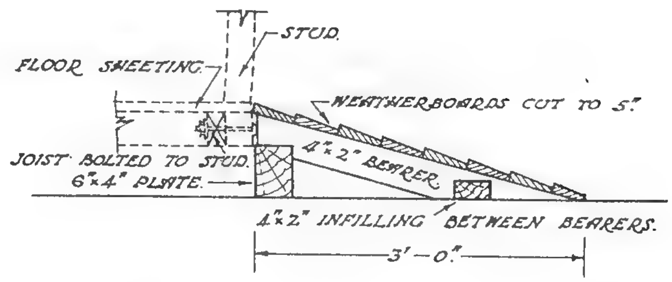
SECTION THROUGH SHED.



PLAN.



DETAIL SECTION A-B.



DETAIL OF RAMP.

SCALE OF FEET FOR DETAILS.

SCALE OF FEET FOR PENS.

PLATE 209.—AN OBJECT LESSON IN PLANT GROWTH.

Members of the Devon Park State School Project Club making observations on crop development in one of their farming plots. Miss M. I. Reeve is the teacher in charge.

PLATE 210.—A TEDIOUS JOB, BUT A LABOUR OF LOVE.

Devon Park Project Club members at work weeding. This new club was formed last August, and the little secretary, Patricia Pearce, writes to say how hard and tedious was the work of digging and preparing the plot for its first crop of pearl millet and sacchaline. The presence of nut grass made the job more difficult. A stray horse in search of a juicy bite caused the first big disappointment. Rain came and turned dismay into joy. A fine crop grew to a great height. When ripe for harvest, a flock of parrots raided the seed heads, and so spoiled a good show exhibit. The disappointing experiences proved, however, a spur to bigger effort, and the club has now a winter grass and fodder plot advancing well towards profitable maturity.

Activities of the Wool and Sheep Branch.

FARMERS' WOOL SCHEME.

THE officers of the Wool and Sheep Branch are of the opinion that young graziers are not fully aware of the help available to themselves in the problems arising in connection with their industry. In these notes, therefore, an effort will be made to bring home to those graziers desiring advice the nature of the help awaiting them on application.

The correspondence dealt with continues to increase year by year, and the subjects touched on embrace a variety covering a wide field. We now deal with over 600 regular correspondents, some of whom write throughout the year.

Interviews at Head Office on all subjects dealing with the sheep and wool industry are constant and daily occurrences.

Visits to sheep properties are undertaken on the application of those interested, free of charge, and advice and instruction given when required.

Culling the Ewe Flock.

Considerable work on this important yearly operation has been undertaken during the last few years. It is the object of the officers concerned to teach graziers to do this work themselves, and, above all, to emphasise the necessity of culling regularly as one of the ordinary operations. There is no quicker road to success than in the elimination of the cull and the retention of the better animal and the one, too, suitable to a particular district. It is our desire, also, to see the culls fattened and eventually going into mutton consumption, rather than being passed on to another selector for breeding purposes. With culling should go hand in hand the use of better rams. Work in the selection of rams has gone on apace, and it is gratifying to be able to state that graziers are taking more care in the selection and use of rams. There is probably no greater economy, in the long run, than the expenditure of a few extra pounds on rams, provided the necessary knowledge is available to choose the right type for a particular district. Studmasters have been approached with the object of getting them to type their sale flock rams, so that graziers are enabled to secure the type advocated, and not, as formerly, having to take fine, medium, and strong in the one run.

Woolclassing.

Woolclassing in the sheds is one of our ordinary occupations throughout the year, and here again every effort is made to teach the small grazier to set out his lines correctly. There has been a feeling, whilst prices for the staple have been depressed, that the correct get-up of a clip has been an unpayable proposition. No greater mistake could be made. With the low prices ruling, the necessity arises to get every penny available for the commodity, and this may be brought about by scientific classing.

Experimental Work.

Officers of this branch are from time to time approached by vendors of new specifics proposed to be used in the sheep and wool industry. Whenever possible, these materials are tried out in a practical way in the endeavour, first of all, to protect graziers' sheep from injury, and,

secondly, in the search for something better than the specifics now recommended.

Health of the Flock.

Health of flocks is of paramount interest to officers of the Wool and Sheep Branch, and in this connection our advice is often sought when visiting the various holdings.

Weeds and shrubs believed to be poisonous or detrimental to the health of the sheep are collected on properties where such have been reported. These are submitted to Mr. White, the Government Botanist, and owners advised what course to take for the eradication of the pest.

Advice is constantly being given with regard to blowfly strike in sheep, and practical demonstrations have been carried out with regard to jetting.

Dipping.

Dipping for the eradication of external parasites has been carried out on various holdings. The spread of lice and ticks in South-western Queensland and on the Darling Downs has been rapid during the last few years, and graziers would be well advised to quickly take this matter in hand. If allowed to spread, the loss in both quality and weight of the fleece is extremely serious. The matter of the spread of external parasites in sheep is regarded with grave concern by the Department of Agriculture and Stock, and iti is possible that, at no distant date in the future, steps will be taken to bring under the notice of sheepowners that clause in the Diseases in Stock Act which provides for the compulsory dipping of infested sheep in certain areas and on the stock routes.

Many satisfactory proprietary dips are offering, and owners should carefully follow the directions given as to mixing. One dipping annually with the right material and carried out from one month to two months off shears should be sufficient to eventually free the property from this pest.

General Practice.

Advice with regard to drought feeding has been sought during a portion of the year just passed, and on all occasions information has been supplied having due regard to the economic aspect of the case.

The prescription of sheep licks for different districts and conditions forms one of our activities. In this connection it is well to note that although many good sheep licks are on the market, graziers would be well advised to consult the Department before purchasing. A lick, even if to be recommended for one locality, is not necessarily suitable elsewhere.

The selection of areas suitable and economical for ringbarking purposes has been carried out during the year, and it is certainly a step in the right direction. The selector who makes two blades of grass grow where previously there was only one or none has certainly not lived in vain.

Our advice is freely sought in the matter of improvements. Always with the proviso against over-improvement, instruction is given in such subjects as the erection of shearing sheds, the layout and construction of drafting yards, the economical erection of fences, and the provision of water.

Fat Lamb Raising.

Some considerable time has been spent on the Fat Lamb Scheme inaugurated by the Minister, the Hon. Frank W. Bulcock, last year.

Suitable farmers were supplied with rams of British breeds with the object of demonstrating to those engaged in the industry the best crosses for the purpose. A great deal of interest has been taken in the scheme, and the results achieved, measured by the lambs already forwarded for sale, are bound to have lasting and beneficial results. It is hoped that the scheme may be extended this year, and that some attention will be given to producing the right type of ewe, so necessary to further the production of the right lamb for export.

Farmers' Wool Scheme.

The Farmers' Wool Scheme, carried out by officers of the Wool and Sheep Branch of the Department of Agriculture and Stock, was brought into being twenty years ago, as the result of the recognition of the fact that farmers with small parcels of wool did not receive market value. Bales, bags, and butts are now received under this scheme, and scientifically classed into large lots, when that is possible. When offered for sale under the Department's own brand, the wool consequently meets with the competition of all buyers, and is, in fact, treated in just the same manner as a station clip. The prices received, compared with the average obtained from all wools offered, have been exceedingly good, having regard to the wools we receive for treatment. Farmers and others would be well advised to avail themselves of the benefits to be received under this scheme. Pastoralists and graziers, too, would be well served if they consigned that odd butt or bag which is so often seen in a woolshed. The cash advance of 60 per cent. of the estimated value of the wool, free of interest, should be acceptable to all those who are free to avail themselves of the advantages of the scheme.

The following are the conditions under which wool may be received for classification and sale:—

1. The Minister for Agriculture and Stock is prepared to assist woolgrowers to obtain the best prices for their wool from—

(*a*) Holdings of less than 1,500 merino sheep;

(*b*) Wool from crossbred and British breeds from any holding;

(*c*) Bags and butts from any holding;

(*d*) Star lots from our present selling agents.

The wool will be received for classification and placed on the market to best advantage for sale.

2. A correct account of the wool will be kept, and each woolgrower will be paid the amount received for same, less the necessary broker's and other charges, which are as follows:—

(*a*) A charge of 10s. per bale for classification. (This charge also includes insurance in sheds, on rail, transit to selling broker's stores.)

(*b*) All freight, cartage, handling, broker's charges, bale account, &c.

3. The Department of Agriculture and Stock will charge no commission. An advance of 60 per cent., free of interest, will be made upon the estimated value of the wool as at the time of its receipt in the Department's store. The freedom from interest on the advance will not apply to wool from crossbred and British breeds and bags and butts from holdings of more than 1,500 sheep.

4. The wool will be sold as soon as possible following a sufficient accumulation to enable the wool to be sold to best advantage.

5. The weights as taken in the Departmental store and the classification before sale are to be accepted as final.

6. Woolgrowers desiring to accept this arrangement should notify the Under Secretary, Department of Agriculture and Stock, when consigning the wool, advice of which, with all particulars, should be given.

7. Consign the wool to the Under Secretary, Department of Agriculture and Stock, Roma street.

RECOMMENDATIONS.

(*a*) The bales should be branded with initials and numbers on the top only, so that the same pack, if in good order, may be used again. This saves the price of a new pack to the grower.

(*b*) All merino wool should be kept separate from other grades and breeds.

(*c*) Locks and belly wool should be kept separate.

(*d*) Remove all dags and wet stains before rolling the fleece. The wool requires no other treatment on the farm.

SALE OF WOOL.

The wool will be sold as soon as possible by wool brokers in rotation as arranged by the Department of Agriculture and Stock.

PLATE 211.—FIRST FRUIT OF PROJECT CLUB WORK.
A Saccaline Plot, Devon Park State School, near Oakey.

UNDER average rainfall conditions remain the prominent feature of the present agricultural outlook, although the position has been relieved in the Lockyer Valley and portion of the Darling Downs.

The season has been very unsatisfactory for the establishment of winter grasses and clovers and is now too advanced for obtaining the best results.

CEREAL CROPS.

The Queensland Wheat Board received 3,670,000 bushels from the 1934-35 crop, which figure does not include grain retained by growers for seed and feed purposes. Given favourable weather conditions, an increased area should be sown during the present season. In the Dalby district, particularly at Pirrinuan, new settlers are preparing land, encouraged by the excellent results obtained in the district from the recent crop. Early sown crops are making fair growth but will shortly require further rains. On weed infested areas, a late sowing may not be an unmixed evil, as it will permit of a final late cultivation to destroy weed seedlings.

The intake of grain for the 1934-35 season by the Queensland Barley Board totalled 113,503 bushels, comprising 94,014 bushels of malting barley, 11,201 bushels of cape, and 8,590 bushels of feed. Satisfactory sales were made to Queensland brewers.

PEANUTS.

Heavy deliveries of seeds are being made to the silos at Kingaroy and a record crop is indicated. The Board is optimistic of clearing the crop, estimated at 5,000 tons from 12,500 acres. Sales are expanding and Australia's consumption definitely increasing, so that growers cannot afford to reduce their acreage if the Board is to maintain continuous supplies. The Northern Territory also contributes to Australia's peanut supplies, the present crop being estimated at 400 tons.

TOBACCO.

The opening tobacco sales were held during May, values being maintained at the previous season's level, up to 4s. per pound being paid. The quality of the new season's crop was favourably commented on by buyers. Curing is still in progress, while the late sown crops in the North are still to be harvested.

RECLAIMED PEAR LANDS.

Within the last three years over sixteen million acres of reclaimed pear land have been available for settlement in Queensland. Development is proceeding, the work of fencing, ringbarking and the provision of water being assisted in many instances by advances from the rural development funds.

Of the total area made available over fifteen million acres have actually been taken up.

SOIL EROSION.

With closer settlement and the continuous cropping of our most fertile agricultural areas, a system of permanent agriculture, such as practised in the old world must now receive serious consideration.

The destruction of forests and the subsequent cultivation is now causing decreased fertility which by the depletion of organic matter in the soil renders the land more liable to further loss by erosion and gullying. An enormous area of valuable land has been rendered worthless in U.S.A. by such agencies, and the prevention of further loss is now being tackled in earnest. The same process is now taking place in our own State, more particularly on the coastal lands where hillside farming is the rule. Sheet erosion is also active on even gentle sloping agricultural lands were the soils are incapable of absorbing the storm rains, thus removing valuable plant foods more rapidly than is done by continuous cropping. Fortunately the systematic construction of terraces and broad base contour drains will do much to retard the erosion and eventual ruination of such lands and farmers are urged to immediately take stock of their individual position in this regard. Rotation of crops and the laying down of strips of pasture will also be of assistance in combating loss.

SUGAR.

Present crop estimates indicate a lighter cane tonnage than last year, and a corresponding lower output of sugar—due to an unusually dry summer. The shorter ratoon and plant will, however, be balanced in some districts by heavy cuttings of standover cane.

In most districts seasonal conditions have favoured a satisfactory cane yield. Even in the far North, where the summer was extremely dry, a later improvement in growing conditions benefited crops considerably, although they are still backward for this time of the year. Fortunately, insect pests were not nearly so active or numerous as they are in seasons of normal rainfall, and that fact, added to the absence of flood damage, has evidently provided ground for the optimism that is apparent in present mill estimates of the probable tonnage to be crushed. Good cane tonnages are assured in the Burdekin area.

The Mackay crop, as it stands at present, is, on the whole, giving promise of fair average quality and yield.

From Bundaberg southwards, growing conditions have not been entirely favourable, although the cane left over after the last crushing should insure heavy cane deliveries at most mills.

The official estimate for the coming harvest provides for an anticipated yield of 4,130,000 tons of cane. Allowing 7·1 tons of cane for the manufacture of 1 ton of sugar, the factory output should approximate 581,700 tons of sugar, as compared with an actual production of 611,727 tons last year.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled for the month of April, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Redberry of Roschill	W. Flesser, Boyland	15,431·96	560·956	Masher of Oakvale
Blossom II. of Oakvilla (229 days)	H. F. Marquardt, Chelmer	13,330·58	523·81	Victory of Greyleigh
Gold III. of Oakvilla	H. F. Marquardt, Chelmer	12,380·57	495·435	Victory of Greyleigh
Blackland's Choice 4th	A. Pickels, Wondai	10,244·86	444·36	Fussy's Monarch of Hillview
Doris 6th of Hilton	E. O. Althouse, Cloyna	10,285·76	357·764	Warrior 16th of the Cedars
Ruby 3rd of Headlands	E. O. Althouse, Cloyna	8,967·34	351·439	Duchess Jellicoe of Fairfield
JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.				
Rocklyn Jean	T. Strain, Wondai	8,977·17	377·936	King of Sunnyside
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Mabel 10th of Sunnyside	Paul Moore, Wooroolin West	9,138·74	371·297	Countess Lad of Cosy Camp
Rosemount Nancy 17th	F. G. Lamkin, Kaimkillenbun	7,740·13	317·761	Bright Star of Cosy Camp
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Gentle II. of Alfavale	W. H. Thompson, Nanango	10,940·56	502·575	..
Alfavale Midge	W. H. Thompson, Nanango	11,658·08	425·069	..
Kurrajong Tina	T. Strain, Wondai	8,412·00	388·066	Cosy Camp Newhaven
Marn June 2nd	R. Martin, Biggenden	5,976·6	267·706	Happy Valley Happy Lad
Model 6th of Alfavale	W. H. Thompson, Nanango	8,657·49	399·233	..
Lavender 5th of Blacklands	A. Pickels, Wondai	9,032·98	338·692	Blacklands Major
Rocklyn Melba	T. Strain, Wondai	7,490·5	310·947	Oakvilla Champion Prince

JERSEY.				
MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Majestic Queen of Brooklands	R. S. Conochie, Sherwood	11,184·65	618·517	His Majesty of Dalebank
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Oxford Sister	M. J. Dunn, Laidley	6,751·7	318·443	Oxford Silvius
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Overlook Remus Frances	E. Burton & Sons, Wanora	9,130·39	519·969	Plemont Remus
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Brooklands Bronze Plate	R. S. Conochie, Sherwood	10,396·35	517·289	Forward of Brooklands
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Shamrock IV. of Ryfield	P. Fault, Cushnie, *via* Tingoora	9,017·32	339·284	St. Athans Angus
Cabulcha Butterfly	J. M. Newman, Caboolture	6,001·65	281·47	Grasmere Autocrat
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Brooklands Royal Mabel	R. S. Conochie, Sherwood	8,606·85	456·141	Retford Earl Victor
Brooklands Royal Belle	R. S. Conochie, Sherwood	5,379·6	327·431	Retford Earl Victor
Oxford Buttercup 9th (272 days)	E. Burton & Sons, Wanora	5,196·5	306·07	Oxford Robin
Trinity Fancy Bloom (231 days)	J. Sinnamon & Sons, Moggill	4,942·5	274·702	Some Hope
Daffodil of Woodbine	J. Williams, Wondai	4,593·03	258·217	Trinity Armlet
Trinity Dreaming Bell (231 days)	J. Sinnamon & Son, Moggill	5,149·6	257·111	Trinity Dreaming Pioneer
Cabulcha Butterfly 2nd	J. M. Newman, Caboolture	4,898·8	250·564	Grasmere Autocr t
FRIESIAN.				
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Oaklands Colantha Lady	W. Richters, Tingoora	9,122·55	351·246	Colantha Lad of Oaklands
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Oaklands Winana Rock V.	W. Richters, Tingoora	5,995·73	248·29	Pied Rock

TUBERCLE-FREE HERDS.

The following herds have been declared free from tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free :—

Owner.	Address.	Number in Herd.	Expiry Date.
H. H. Dight	Warwick	37	24/10/35
R. A. Slaughter	Clifton	16	31/10/35
Paterson & Paterson	Croxley, Oakey	78	28/11/35
Grimmett & Son	Sherwood	61	1/12/35
Clayton Brothers	Tinana	95	20/2/36
E. H. Heale	Riverdale, Kureen ..	34	22/2/36
C. Sentinella	Graceville..	43	1/3/36
G. T. Fleming	Edge Hill, Cairns ..	25	16/3/36
D. R. Hutton	Cunningham	42	22/3/36
Mrs. F. Thomason	Highleigh, *via* Cairns ..	131	28/3/36

ABORTION-FREE HERDS.

The following herds have been declared free of contagious abortion (Bang's disease), in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner.	Address.	Number in Herd.	Expiry Date.
H. H. Dight	Warwick	37	24/10/35
Grimmett & Son	Sherwood	61	1/12/35
F. P. Allan	Stoneleigh, Oxley ..	63	1/2/36
Clayton Brothers	Tinana	95	20/2/36
C. Sentinella	Graceville..	43	1/3/36

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

THE ROTHAMSTED REPORT.

The appearance of the Rothamsted Report is an annual event of some importance to all interested in the technical advancement of farming. Agricultural advisers, teachers, and students, as well as the growing body of well-informed farmers derive from its pages a considered statement of the results of the past year's experiments on plant nutrition and plant disease. For many readers the conclusions drawn from the experiments will suffice; but for the increasing number of technical readers who are interested in the development of field experimentation there is a section dealing with the design and presentation of the results of experiments and the use of tests of significance. For all the more important experiments and those showing new features of design the plans and individual plot yields are set out in full. Summary tables follow, and the appropriate standard errors are clearly indicated.

The report falls into two sections, one dealing with the field work on fertilizer and cultivation problems at Rothamsted, Woburn, and many outside centres in various parts of England; the other, summarising the laboratory investigations whose details are to be found in the fifty-two scientific papers and twenty-nine technical papers published in 1933.

In recent years uniform schemes of field experiments conducted at a number of centres have largely taken the place of the isolated trial, and in the present report will be found summaries of three series of this kind. One deals with the results of ten years' experiments on malting barley, a second sets out the first year's results of an investigation of the fertilizing value of poultry manure, the third deals with the effect of fertilizers on the yield and quality of sugar beet. A useful review of ten years' fertilizer experiments on potatoes has been included, and a condensed summary of the main findings of fifty years' work at the Woburn Experimental Farm.

Turning now to the laboratory work, full abstracts of all scientific papers are provided, but mention should be made of several lines of work whose bearing on current problems is direct and immediate.

On the chemical side a comprehensive study is being made of the determination of manurial requirements of field soils by means of laboratory tests, using the now extensive body of accredited fertilizery experiments built up in recent years. A study of cultivation problems in the field is being made by the staff of the Physical Department, an aspect in agriculture that becomes increasingly important as farm mechanisation proceeds. Two aspects of the question in particular are receiving attention. Rotary cultivation, being fundamentally different in its action from the traditional methods, is being studied in relation to the nature of the tilth produced and its effect on the germination and growth of the crop. Contrary to the common idea the tilth produced by rotary cultivation differs from an ordinary seed-bed, not so much in its fineness, but rather in its openness or fluffiness, as direct measurements in the field have shown. Another important series of experiments test intensive against normal cultivations, the latter being just sufficient to keep down weeds. Up to the present no definite benefit has resulted from the extra stirring of the soil. This point is important, and is being followed up.

The study of the purification of effluent waters for agricultural industries, successfully undertaken by the Microbiological and Fermentation Departments in the case of beet sugar factory effluents, has now been extended to the more difficult problems of milk factory effluents. Work on virus diseases continues, and a detailed investigation of the causes in the fluctuation of insect populations is now in progress. Problems of bee management have been studed at Rothamsted for some years. At the request and with the active support of practical beekeepers this work has been extended to include the investigation of bee diseases, and a start has been made on the serious and obscure brood diseases of which the European and American Foul Brood are the most important. In the Insecticide Department important studies on pyrethrum and other vegetable poisons are reported. The crops themselves can be produced in the tropical and temperate parts of the Empire.

The report contains a valuable section dealing with the contributions of Rothamsted to the development of the science of statistics written by Professor R. A. Fisher, formerly head of the Statistical Department. This work has had a profound influence on the design and interpretation of biological experiments and the field arrangements developed are in use all over the world. In 1933 a beginning was made in the study of the technique of feeding experiments. An account is given of an experiment on pig management designed to test the possibility of applying to animal experiments the methods that have been so successful in modern field trials. Conclusive results were obtained, showing the necessity of green food for the growing pig and the advantage of wet over dry feeding. The number of pigs run together in a pen had no appreciable effect on their performance.

Answers to Correspondents.

BOTANY.

Fungi.

J.C. (Brisbane)—

It is not possible to say what the particular species a mushroom described by your correspondent is, as several species are found in Australia, and at least three or four of these occur in Queensland. From the description and size, we are inclined to think it is *Panus conchatus,* which emits a white light. Another sometimes found on tank stands, stumps, &c., is *Hiatula Wynniæ.* In place of the usual white or yellowish luminosity, this particular species, which is quite small, gives a bright green light. The luminosity of these fungi, or mushrooms, is not phosphorescence in the true sense. The glowing cannot be produced by heat, nor is it due to the formation of some readily oxidisable compound of phosphorus in the fungus. It is essentially a phenomenon associated with life, and disappears on the death of the organism. Professor D. McAlpine, a recognised authority on Australian fungi, and who has studied the luminous ones in Australia, regards the light produced as a form of energy set free in the process of destructive chemical changes in the living cell.

Misnamed Native Trees.

M.H. (Theodore, Dawson Valley)—

The specimen represents *Pittosporum phillyroides,* a native tree found in all the Australian States, with the exception of Tasmania. We do not think, however, it is anywhere very abundant. It is sometimes called "Native Willow," and we have not heard the name "native orange" applied to it. The latter name we have generally heard given to *Capparis Mitchellii,* the Bumble Tree. The name "Yellowwood" is given to two other trees in Queensland, of which one is a fine timber tree, *Flindersia Oxleyana,* common in coastal and sub-coastal jungles or rain forests; the other, *Terminalia bursarina,* common in the neighbourhood of Emerald, and causes "staggers" or "shivers" in sheep. Your *Pittosporum* is rather a handsome tree, and worth growing on account of its ornamental fruits. The flowers also, though small, are pleasing, and, if we remember rightly, scented rather sweetly. It is somewhat different in appearance from most other members of the *Pittosporum* family.

Plants from Charleville Identified.

H.B. (Charleville)—

(1) *Bassia uniflora;* (2) *Bassia echinopsila;* (3) *Rhagodia parabolica;* (4) *Striplex Muelleri.*

Specimens Nos. 1, 2, 3, and 4 are all members of the Saltbush family. The fodder value of them varies. No. 4 is one of the commonest Saltbushes in many parts of Queensland, and in some districts stock are said to reject it, but in others it is regarded as quite good fodder. Generally stock seem to prefer it when it is dry to when it is green and luxuriant.

5. *Myoporum deserti.*—This plant is allied to the Fuchsia (*Eremophila maculata*), but, unlike that plant, it does not contain a prussic-acid-yielding glucoside. It has, however, been proved definitely by feeding tests to be poisonous to stock, but what the poisonous principle is has not been determined. Acute constipation and intense inflammation of the digestive tract are features of *Myoporum* poisoning. Most of the trouble occurs in travelling stock.

6. *Alstonia constricta,* commonly called "Native Cinchona" or "Quinine Bush." So far as we know, it does not contain any poisonous properties. The bark is sometimes use as a tonic.

Veldt Grass.

J.B. (Jimbour)—

The specimen of *Eriochloa* forwarded by you does not represent Veldt grass. Veldt grass has been tried spasmodically in Queensland, but does not seem to thrive here. Climatic conditions in the southern parts of Western Australia, where Veldt grass thrives, and in Queensland are different. Most Cape plants require a winter rainfall and a dry summer. The *Eriochloa* early spring grass is a native of your district.

Tick Trefoil.

G.H.L. (Gympie)—

The specimen represents *Desmodium triflorum*, a species of Tick Trefoil. The name "Tick Trefoil" refers to the fact that the small pod breaks up into a number of pieces each armed with several hooks or bristles which stick to clothing, the hairs of animals, &c., and thus are carried about. The plant is a legume and quite a valuable forage. The only disadvantage it possesses is that in heavily grazed paddocks it grows rather close to the ground to enable cattle to get much of a bite.

Trees for Charleville District.

A.O. (Charleville).—The following trees listed should do well about Charleville:—

Celtis sinensis, the so-called Portugese elm. We do not remember seeing any of these trees growing about Charleville, but they are well worthy of trial and, we think, would be an acquisition to the district. The leaves make excellent fodder for cattle. They are deciduous for a short time during the winter, but this is of no great consequence, as shade is no great consideration during the winter months. You may have difficulty in obtaining this through the ordinary commercial channels, but we think the Botanic Gardens, Brisbane, could supply.

Melia dubia, White Cedar. This does very well about Charleville, but it is rather subject to borer attack.

Schinus molle, Pepperina Tree or Pepper Tree.

Sterculia rupestris, Bottle Tree.

Sterculia diversifolia, Currajong.

Bauhinia Hookeri, Native Bauhinia or Western Ebony. One of the most beautiful trees that can be grown in the West. It is very slow-growing. We think the Botanic Gardens, Brisbane, has it in stock and could supply.

Phytolacca dioica, the Bella Sombra Tree. We have not seen trees of this growing as far west as Charleville, though we have seen one or two good specimens about Roma. It is a remarkably quick-growing tree, but has rather a swollen, gouty stem. Like the Celtis, the leaves are excellent fodder for stock.

In addition, the following are worthy of trial as possibly growing quite well in your district:—

Flindersia australis, Crow's Ash.

Jacaranda mimosæfolia, Jacaranda.

Ficus spp. Any native Fig such as the Moreton Bay, Port Jackson, &c.

Calodendron capense, Cape Chestnut.

Pinus spp. Any variety of Pine.

Nephelium tomentosum.

Schotia brachypetala. A beautiful red-flowering tree.

You might find some of the trees listed difficult to obtain through the ordinary commercial channels, but we think the Botanic Gardens, Brisbane, could supply them in most cases. The Botanic Gardens, Brisbane, are not under the control of the Government, but under the Brisbane City Council, and we think a charge is usually made of 2s. per tree, plus, of course, carriage. As the planting of some of these unusual trees would be in the nature of an experiment and of educational value, you might, perhaps, approach your own Department or the Brisbane City Council to help you in the matter.

Parramatta Grass.

O.B. (Innisfail)—

The specimen represents *Sporobolus Berteroanus*, sometimes called Parramatta Grass, also Rat's Tail Grass; very common in coastal Queensland; found in old cultivation paddocks, or anywhere where the ground has been disturbed. It is a very tussocky, hard grass, and though stock eat it readily enough in its young stages, they do not care for it so much when old, and on the whole its palatability and nutritive values are rather low. It has caused some concern on parts of the near North Coast between Brisbane and Landsborough, on account of it invading worn patches in paspalum pastures.

Rural Topics.

Wounds in Horses—Simple treatment.

The fundamental principle underlying all wound treatment is to endeavour to provide suitable downward drainage for the discharges from the wound. If such drainage is provided then most wounds tend to heal satisfactorily, but deep wounds penetrating downwards and which form pockets progress unsatisfactorily for the reason that pus and discharges collect within them and cannot get away. Wounds which penetrate in an upward direction need little interference beyond ensuring that they remain open while healing from their deepest part and that they are reasonably clean on the surface. In the case, however, of downward penetrating wounds it is very necessary to judiciously use a knife in order to provide that the discharges can flow freely downwards.

Before any wound treatment is attempted it is desirable that the injured edges of the wound be clipped with scissors to remove the hair and reveal the true nature of the wound. The next step is to wash thoroughly with warm weak disinfectant solution. Then, if necessary, the depth of the wound can be explored with a blunt instrument which has been boiled or with the fingers after the hands have been thoroughly washed and scrubbed. A good and common example of an improperly drained wound is a nail or other puncture of the sole of the hoof. Microbes are carried in when the foot is punctured, pus of a black liquid and foul smelling nature collects in the foot, continues to accumulate because it cannot drain away, and acute lameness follows. If unattended to these corrupt fluids rise slowly above the level of the horn and eventually break out through the soft skin over the coronet; but by this time the structures within the foot are in a nasty mess and the case has become an extremely serious one.

To deal with these hoof punctures the whole foot is cleaned and, if possible, is held in a bucket of warm disinfectant solution to still further clean it and also soften the horn. The sole of the foot is then pared away by making a cone-shaped hole over the point where pain is most acute or it is known that the foot was punctured. The apex of the cone must be carried right through the horn, and when this happens the corrupt fluids will escape and lameness almost immediately disappears. To prevent the hole filling up when treated, &c., a pad soaked in Stockholm tar is placed in position and held by a tin plate interposed between the sole of the foot and a shoe. If attended to thoroughly in the manner described these cases need little further attention beyond dressing once or twice weekly to ensure that the horn is not growing over before all the discharges have got away.

Skeleton Weed.

Numerous inquiries have been received recently at the Department of Agriculture and Stock regarding Skeleton Weed (*Chondrilla juncea*), a native of the Mediterranean Region and Central Europe, now one of the worst weed pests in the Riverina and much of the wheat belt in New South Wales. One shire has already approached the Government with a request that the plant be declared a noxious weed for the whole State. The Government Botanist, Mr. C. T. White, points out that the weed has not yet been found in Queensland, and that like many weeds of the New South Wales and Victorian wheat belts such as St. John's Wort and Stink Wort there is a hope that it may not establish itself here. Even when some of these plants such as blue weed or Paterson's curse do reach Queensland they generally fail to become the serious pests here that they are in the Southern States.

So that farmers, however, may keep a lookout for the weed it may be said that it has a long taproot, a rosette of lobed leaves at the base lying more or less flat on the ground, a branching stem bearing very narrow leaves and numerous yellow flowers of the daisy type. These have in their middle a few seeds which bear several rows of tooth-like prickles towards the top, and are surmounted by a slender stalk with a tuft of hairs at the top. New South Wales authorities state that seedlings are easily destroyed, and it is by pieces of the root and rot-stock carried about on farm inplements, &c., that the plant is usually spread. Farmers and others seeing any plant they consider might be Skeleton Weed are advised to send specimens to the Department of Agriculture and Stock for correct identification.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

WINTER INFECTIONS.

THERE are a number of infectious diseases which attack the air-passages and throat, and most of them are more common in the cold season. Of them the most frequent are the infectious catarrhs, which we call "colds," and the closely-allied infections called influenzas, which vary from slight illnesses to deadly epidemics. Their attacks confer only a short immunity, varying from a few weeks to perhaps twelve months. With other diseases of this class immunity is very lasting and may continue for the rest of life. Here we include measles, whooping cough, scarlet fever, and diphtheria. In all these diseases, whether slight or severe, complications occur due to secondary invasion of the air-passages, lungs, and ears, not so much by the virus of the original disease as by infective bacteria, which take advantage of the weakened resistance of the patient to cause bronchitis, pneumonia, and abscess of the ears. Except in diphtheria and the malignant forms of influenza, it is these complications which cause the most serious illnesses and deaths. The total mortality is large at all ages, particularly in young children, including infants in their first year.

How We Become Infected.

The living germs of these diseases exist in countless myriads in the secretions of the mouth, throat, and nose of the sufferers, but it is a great mistake to imagine that those who are sick in bed are the main source of danger. Few can be infected by them. The most dangerous are (1) those suffering from mild attacks, who move about freely among other people, (2) those who have recovered, but still have not become free of the disease germs, (3) those who by reason of their high resistance are immune to the disease, but though not sick themselves, carry the germs in their secretions, and so infect other people. These three classes of "carriers" are the chief spreaders of these diseases, and there is no way in which we can certainly avoid them.

The methods by which the germs are usually conveyed from person to person are very simple. The most common is by coughing. Every cough expels great numbers of extremely fine particles, most of them so small as to be invisible. This invisible spray floats in the air as an invisible cloud around the carrier, until the wind blows it away, or until it very slowly settles down. It is easy to understand that any person near him cannot avoid inhaling the germs. The carrier is least dangerous in the open air; most dangerous in rooms with closed doors and windows. That is why these infections are most prevalent in winter. Where a number of people are gathered together in a hall some carriers are almost certain to be present. The danger increases with the degree of crowding and the greater absence of ventilation.

There is another method of spread which is especially frequent among children. We may call it the method of spread by "smearing." Most young children, having been taught no better, put their fingers into their mouths or rub them over their noses. These moist fingers are then applied to their clothes and toys, to the hands and faces of their playmates, and infect everything they touch. This method is very effectual in diphtheria and scarlet fever, which usually do not excite cough, but it applies to all the infections we are considering. Not only are diseases of the throat and air-passages conveyed in this way. The same is true of infectious meningitis, which has caused so many deaths in the past. Many believe that infantile paralysis is similarly spread by carriers.

How Infection may be Prevented.

Some people catch every infection; others seldom fall to them. In other words, we are not all equally susceptible; we have different degrees of resistance. Most susceptible are babies, young children, and people who are poorly nourished, in spite often of a sufficiency of food, and sometimes from over-indulgence in certain foods. Our milk-starved children are among those who suffer most. We must endeavour to build up resistance, and for this a good diet rich in vitamins is most valuable.

Resistance is a matter of degree. The poorly resistant may be infected by a small number of germs, which would not injure the more resistant, but might even increase their resistance. Yet the more resistant may be overcome by breathing in large numbers. As we cannot avoid these germs altogether, it is important to avoid taking in a large overwhelming dose of them. Fresh air and open windows are a safeguard; closed rooms and crowded halls are dangerous. Those who cough recklessly should be avoided; and children should be taught better habits. More particularly babies and young children should not be taken to picture shows and evening entertainments. School children must, of course, run some risk, but large classrooms and good ventilation without over-crowding would lessen these risks. Against diphtheria we are, fortunately, able to immunise them by preventive injections.

MATERNITY AND INFANT WELFARE.

The following paragraphs give point to the appeal for public assistance to the King's Jubilee Fund:—

Proper training of doctors, nurses, and midwives in maternal and infant welfare is essential. The King's Jubilee Fund for preserving the lives of mothers and children aims to secure this result. Your contributions and co-operation are needed.

A vital need is the establishment of ante-natal and post-natal services for mothers in city and country. Upon the welfare of mother and child depends the strength of the Australian race. Therefore, support the King's Jubilee Fund, whose proceeds will be devoted to maternal and infant welfare.

How many of the general public realise that one mother in every two hundred pays the supreme penalty for maternity? There may be features which qualify these statistics, but when one recognises that in some hospitals there are no deaths at all, it is obvious that reform is possible. Therefore contribute and work for the King's Jubilee Fund to advance the cause of motherhood.

The Jubilee Fund to assist maternal and infant welfare takes the form of a gift to the King and Queen to celebrate the first twenty-five years of their reign. There is an obligation on every son and daughter to contribute.

Queen Mary is something more than the British Queen; she is a mother. Australians know three of her sons by personal contact—the Prince of Wales, the Duke of York, and the Duke of Gloucester. Two others we know by repute—the Duke of Kent and Princess Mary. The Jubilee Fund for Maternal and Infant Welfare is a tribute to the motherhood of the Queen. Pay your tribute to her by supporting the Jubilee Fund!

The British Empire depends upon healthy mothers and healthy children. By contributing your mite to the Jubilee Fund you will contribute to the might of the British Commonwealth of Nations.

£50,000 has been contributed by the Commonwealth Government to establish a Maternal and Infant Welfare Fund for Australian women and children as a jubilee gift to the King and Queen. The general public is asked to supplement the £50,000 so that some worth-while memorial may be established. Every penny will help.

The establishment of a healthy race, fit to overcome the great problems associated with the development of Australia, begins in the maternity service. Every citizen should contribute to the Jubilee Fund.

IN THE FARM KITCHEN.

MEAT COOKERY.

WAYS OF COOKING MEAT.

(*a*) Broiling or pan-frying.

(*b*) Baking or roasting.

(*c*) Boiling.

(*d*) Pot roasting, braising, encasseroling, stewing.

In general, for (*a*) we use steaks, chops, and minced meat; for (*b*) ribs, round, rump; for (*c*) corned beef, shank end, neck, thin flank, brisket, and thin ribs; for (*d*) shoulder, thin ribs, flank, and brisket.

Meat is one of the protein foods, which means that it needs cooking at a low temperature after the outside surface has been sealed to keep in the juices and flavour. If meat is cooked at a high temperature for the necessary time, we find it has become tough and difficult to digest. This will explain why sometimes babies are given *raw* beef juices—the cooked meat could not be digested at all by them, although it is quite safe to give them the juices.

For tender cuts of meat, it is unnecessary to have long, slow cooking, which accounts for the fact that we usually cook these cuts by frying, broiling, or baking.

Long, slow cooking, after the outer surface has been sealed, will make tough cuts tender enough to be palatable, and these tough cuts are generally much cheaper than the better-known and much-sought-after expensive cuts.

The exceptions to this rule for cooking meats are the cured and "soup meats," which are started in cold water, as the object in the case of soup meat is to draw out as much flavour and nutriment as possible, instead of sealing them up inside; and the flavour of the cured meats is too strong unless they are started in cold water.

It is well known that meat is an expensive item in the household budget, and housewives could get the same amount of nourishment at a lesser cost if they knew more about the uses of the different cuts of beef, lamb, and pork. The expensive cuts average about one quarter of total dressed weight, and this, coupled with their popularity, means higher prices.

Another point is that housewives fail to take advantage of the seasonable meats or cuts which may be plentiful.

The "fancy" meats—liver, heart, &c.—are usually very inexpensive, and they give high food value for the outlay, as they are rich in mineral matter, especially iron, which is so necessary for enriching the blood.

TIME-TABLE FOR COOKING MEAT.

Lamb.—This should be cooked, so that when cut, the meat is slightly tinged with pink.

Leg, roasted: 15 minutes per lb.

Chops, broiled: 8-10 minutes per lb.

Shoulder chops: 10-12 minutes per lb.

Shoulder, roasted: 15 minutes per lb.

Pork.

Chops: 10-12 minutes per lb.
Loin roast: 20-25 minutes per lb.
Shoulder roast: 30-35 minutes per lb.
Ham, baked: 20-25 minutes per lb.
Ham, boiled: 20-30 minutes per lb.

Beef.

Broiled steaks: 8-10 minutes per lb.

Rib roasts: 10-15 minutes per lb.

Round or rump roast: 12-15 minutes per lb.

Rolled shoulder roast: 15-20 minutes per lb.

Shoulder or short rib (braised): 30-40 minutes per lb.

Shoulder, brisket, or short ribs, pot roasted: 30-35 minutes per lb.

Corned beef, boiled: 25-30 minutes per lb.

FOOD VALUE OF MEAT.

It has already been mentioned that meat is a protein food, which means that it helps to build up body tissue, and certain parts, such as liver, heart, &c., contain certain valuable vitamins and mineral salts.

An excess of meat in the diet, however, leads to various troubles, such as rheumatism and high blood pressure. Once a day is sufficient to serve meat, as there are so many other foods in the same class which can be used to give the body the necessary nourishment. These are cheese, eggs, milk, and beans and peas. Meat, on the whole, is more difficult to digest than many other foods, and therefore should not be given to children under two years old, except occasionally in the form of gravy and juices.

The following are the different beef cuts and uses for each:—

Shin: Soup meat and brawn. This is a very cheap piece.

Silverside: Salt beef and biltong. An economical cut.

Topside: Steak, roast, braised, pot roast, biltong.

Aitch bone: Roast, salt beef.

Rump: Fried, grilled.

Fillet: Fried, grilled.

Sirloin, cuts 1, 2, 3, 4: Roast, first cut is the best, as there is most fillet.

Wing rib: Braised. Roast. An economical cut.

Fore Ribs; sirloin steaks: Rolled and braised.

Middle ribs: Stew or braise. Mince meat. A cheap cut.

Back ribs: Same as foregoing.

Neck: Soup meat. Mince.

Foreshin: Soup meat and brawn. (Cheap.)

Brisket: Braising and pot roast. (Cheap.) Salted and rolled. (Cheap.) Pressed. (Cheap.) Spiced. (Cheap.)

Short ribs: Braising and soup meat. (Cheap.) Rolled and stuffed. (Cheap.)

Thin flank: Rolled and stewed with other meat, as it is a fatty piece. (Cheap.)

Thick flank: Stewing steak. (Cheapest cut.) Pot roast.

Leg: Roast.

Kidney; liver; hearts, &c.: Fried, braised, broiled.

Skirt steak: Stew (preferably with oxtail).

Chuck rib steaks: Stew and mince. (Tender cut.)

Hump: Salted. (Cheap.)

Pork.

Head: Roasted or fried.
Chump end: Roast.
Middle loin: Roast or chops.
Best end: Roast or chops.
Blade bone: Boiled.
Spare rib: Salted, roasted, or fried.
Chops: Salted.
Belly; hand: Salted.
Trotter; hock: Brawn.
Leg: Roast or salted.

Mutton or Lamb.

Shank end or knuckle: Soup meat.
Leg: Roast.
Fillet end: Roast.
Loin: Roast.
Saddle: Roast.
Neck: Roast and stew.
Best end; middle; scrag end; shoulder; Boned, rolled, and stuffed, then pot-roasted or braised.
Breast: Braised. Curry.
French cutlets: Crumbled and fried.

GENERAL RULES.

(1) Weigh meat to tell length of time required for cooking, and to see that correct weight is secured.

(2) Remove meat from paper, and keep in a cool place.

(3) Wipe meat with a damp cloth, kept for the purpose. Never wash meat under the tap.

(4) When roasting or pan broiling, always sear the surface of the meat to keep in the juices.

(5) For soups, put meat in cold water, to extract juices.

(6) When boiling meat, put it into boiling water to prevent juices from escaping.

(7) When boiling hams, put on in cold water and boil slowly to extract the salt. Boil about 20 minutes to the pound.

All recipes are on the basis of six servings. c. = cup, T. = tablespoon, t. = teaspoon.

ROAST LEG OF MUTTON AND BROWN GRAVY.

1 leg of mutton (4½ lb.).	1 onion.
1 t. salt.	1-2 bay leaves.
¼ t. pepper.	Dripping.
½ t. sugar.	About 1 c. water.
1 T. vinegar.	

(1) Clean thoroughly and trim as desired.

(2) Rub the vinegar, and then the dry ingredients into the meat.

(3) Put the meat in the pan. Pour in the water, add the leaves and onion. If the mutton is lean, put the dripping on the lean parts.

(4) Place in a hot oven, allowing the meat to brown quickly on all sides. (This is called searing.) It will take about ½ hour to brown nicely.

(5) Decrease the heat and allow the meat to cook slowly until done.

N.B.—Time required; 20-25 minutes per lb. plus 20 minutes extra.

If the pan becomes dry, a little more water may be added from time to time.

If the meat is cooked before it is actually time to serve it, cover it with a pan to prevent it from drying out.

BROWN GRAVY.

(1) Pour fat from meat pan, allowing 2 T. fat for each cup of gravy.

(2) Put fat for gravy back into pan and add an equal quantity of flour.

(3) Stir fat and flour over hot fire until well browned.

(4) Add water or stock gradually; 1 c. for 2 T. fat and 2 T. flour.

(5) Season to taste with salt and pepper.

BEEF OLIVES.

1 lb. good steak.	1 oz. suet.
2 oz. breadcrumbs.	$\frac{1}{2}$ t. salt.
1 egg.	$\frac{1}{4}$ t. pepper.
1 t. chopped parsley.	A little grated lemon peel.
A grate of nutmeg.	Stock or gravy.

(1) Cut steak thin and divide into 6 pieces.

(2) Dip a rolling pin into cold water, and beat each piece out flat.

(3) Trim nicely.

(4) Cut trimmings up very finely, and add to the breadcrumbs and other ingredients and make into a forcemeat with the egg.

(5) Divide into 6 portions.

(6) Place each portion on a piece of steak, and form into a neat roll. Tie up each end with cotton or a skewer.

(7) Put a little dripping into a pan, and when very hot fry the olives quickly until slightly brown.

(8) Put olives into a cassarole, and pour on just sufficient stock or gravy to cover them.

(9) Simmer gently for $1\frac{1}{4}$ hours.

A few minced olives or a bit of pickled walnut is an improvement to

N.B.—If the steak is tough, they may simmer longer.

the forcemeat.

LAMB TERRAPIN.

2 T. butter.	1 t. dry mustard.
2 T. flour.	1 c. stock.
1 T. Worcester sauce.	$\frac{1}{2}$ c. cream or milk.
2 c. diced cold lamb.	2 hard cooked eggs.
Toast.	Parsley.

(1) Melt butter and rub in flour and mustard.

(2) Add cream or milk and stock and Worcester sauce.

(3) Cook well.

(4) Add lamb and hard cooked eggs cut in pieces.

(5) Heat thoroughly before serving.

(6) Garnish with triangles of toast and parsley.

SPANISH STEAK.

A piece of round steak, 4 inches thick.	Salt.
Stock, tomato juice, or gravy.	Chopped onion.
Flour.	Fat.
Pepper.	

(1) Pound steak and pound flour thickly into it.

(2) Rub in pepper, salt, and chopped onion.

(3) Melt fat in pan and brown surfaces of meat well in it.

(4) Surround meat with stock to within 1 inch of top of meat. Tomato juice or gravy may be used.

(5) Simmer 4 hours.

ROAST BEEF AND YORKSHIRE PUDDING.

The best cuts of beef to use for roasting are: Sirloin, ribs, aitch bone, round or part of rump.

Allow 15 minutes for every pound of beef and 15 minutes over.

(1) Wipe meat with damp cloth.

(2) Sprinkle with salt and pepper and dredge well with flour.

(3) Place in roasting pan and dot a few pieces of fat or dripping on top.

(4) Put water into pan around meat, about a quarter of an inch deep.

(5) Cover pan and allow beef to steam thus until the water has boiled away.

(6) Remove cover and roast in the oven in the ordinary way.

(7) Sear surfaces in a very hot oven to prevent escape of juices.

(8) Remove to cooler part of oven until meat is done.

N.B.—Baste the meat every now and then with melted fat to prevent it from drying out.

YORKSHIRE PUDDING.

1 c. milk.	¼ t. salt.
1 c. flour.	1 t. baking powder.
2 eggs.	

(1) Sift flour, baking powder, and salt together.

(2) Add milk gradually.

(3) Add eggs beaten until very light.

(4) Pour hot beef fat into a pan, or use the pan in which the beef was roasted, after the beef has been removed.

(5) Pour mixture into pan about ½ inch deep.

(6) Place beef on a cake cooler over pan, so that juice may drip on to pudding while it is baking.

(7) Bake 20 minutes in a hot oven.

(8) Cut into squares for serving around roast beef.

TOMATO BREDEE.

3 lb. ribs of mutton.	2 dozen tomatoes.
3 onions.	2 T. dripping or fat.

(1) Cut mutton into small pieces.

(2) Flour each piece thoroughly, and sprinkle with salt and pepper.

(3) Fry onions in dripping to a light golden brown.

(4) Remove skins from onions.

(5) Add meat and tomatoes to onions.

(6) Stew gently for at least 3 or 4 hours.

N.B.—If tomatoes are very acid, add one or two tablespoons of sugar.

SHEEP'S HEAD AND TROTTERS.

To Prepare.

(1) Put into cold water for 1 hour.

(2) Make a mixture of boiling water and lime—4 oz. lime to 2 gallons of water.

(3) Dip head into the boiling solution and scrape clean.

(4) Wash off in clean cold water.

(5) Chop along sides of nostrils through the bone.

(6) Remove eyes and ears, chop through the centre of head.

(7) Remove brain and tongue.

(8) Put trotters into the boiling lime water.

(9) Scrape clean.

(10) Chop between the cleft in the foot to the first joint.

(11) Remove the hard shell over toe.

(12) Place all in a dish of cold water.

To Cook.

1 head.	Salt and pepper.
4 trotters.	3 T. vinegar.
4 or 5 onions.	3 cloves.

(1) Put head and trotters into a dish of salt water for 1 hour. 1 T. salt to 1 gallon of water.

(2) Boil slowly in the following mixture for about 8 hours:—
Water enough to completely cover head, &c., onions, pepper, salt, and vinegar.

(3) When done, remove bones from mixture and serve hot.

N.B.—If desired, pour into moulds, and when mixture is set, serve cold.

ROAST STUFFED CHICKEN.

Stuffing.

2 c. stale breadcrumbs.
3 T. butter.
¼ t. salt.
1 beaten egg.
¼ t. pepper.
1 t. powdered sweet herbs or spiced poultry seasoning.
1 T. chopped parsley.
2 finely chopped raw potatoes.
Enough milk to moisten.

(1) Mix ingredients thoroughly.
(2) Stuff chicken.

Chicken.

1 Fowl about 6 lb.
Pepper and salt.
¼ c. water.
1 T. vinegar.
3 T. butter.
Flour.

(1) Place stuffed fowl in pan.
(2) Season with salt and pepper and dredge lightly with flour.
(3) Place butter on fowl.
(4) Put vinegar and water in pan.
(5) Cover pan.
(6) Simmer gently for 1 hour, on the top of the stove.
(7) Remove cover of pan.
(8) Brown quickly. This will take about ½ hour.
(9) Turn fowl occasionally to brown every side.

Gravy.

Make same as gravy for roast leg of mutton.

CRUMBED PORK CHOPS.

6 pork chops.
Salt and pepper.
1 egg.
1½ c. dried bread-crumbs.
¼ c. vinegar.
1 c. flour.

(1) Wipe chops.
(2) Sprinkle with vinegar, and let stand for ½ hour.
(3) Place chops into hot frying pan, and fry for 1 minute on each side.
(4) Roll in flour, dip into beaten egg and roll in bread-crumbs.
(5) Put back into hot fat in pan, and fry slowly for ½ hour.

BOILED HAM.

(1) Weigh the ham.
(2) Scrape and scrub thoroughly with a brush.
(3) Cover with cold water.
(4) Bring slowly to boining point and let boil a few moments.
(5) Skim.
(6) Let boil until tender. (About 20 minutes to each pound.)
(7) When tender, set aside to partially cool in the liquid.
(8) Remove from liquid and draw off the skin.
(9) Brush over with beaten yolk of egg diluted with milk.
(10) Sprinkle with yellow sugar and cracker crumbs, mixed together. (Toasted bread crumbs could take the place of cracker crumbs.)
(11) Stick a few cloves into the ham.
(12) Put in the oven to brown the crumbs.
(13) Cover the bone with a paper frill.

FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs phloxes, sweet peas, lupins, &c., plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot where they will start gently and be ready for planting out in August and September.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist springtime to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish off pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transported into the open ground. Many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur pansy, petunia, *phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors; plant bulbs such as anemones, ranunculus, fresias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queensland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Orchard Notes for July.

THE COASTAL DISTRICTS.

THE marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated, do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the bettles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated; but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description for the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing; well-packed boxes always realising a much higher price than indifferently packed ones on the local market.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JULY is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is under-sized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

PLATE 212.—PROUD OF HIS PLOT.
An example of Project Club work at Devon Park State School, near Oakey.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April. 1935.	April. 1934.
North Coast.	In.		In.	In.
Atherton	4·34	34	3·23	6·05
Cairns	11·55	53	3·41	13·38
Cardwell	8·90	63	4·37	11·16
Cooktown	8·82	59	2·45	12·86
Herberton	3·90	49	2·00	4·39
Ingham	7·74	43	3·99	4·19
Innisfail	20·30	54	9·47	39·35
Mossman Mill	8·77	21	4·68	4·42
Townsville	3·44	64	0.47	1.69
Central Coast.				
Ayr	2·52	48	1·05	1·03
Bowen	2·75	64	1·73	0·81
Charters Towers	1·53	53	..	1·09
Mackay	6·31	64	3·17	3·02
Proserpine	5·86	32	7·76	4·39
St. Lawrence	2·83	64	0·43	2·05
South Coast.				
Biggenden	2·26	36	1·31	4·55
Bundaberg	3·29	52	7·04	11·91
Brisbane	3·86	84	3.62	6·33
Caboolture	4·66	48	4·23	16·19
Childers	2·93	40	2·77	6·13
Crohamhurst	6·74	41	4·82	15·90
Esk	3·12	48	2·22	3·91
Gayndah	1·49	64	0·74	2·05
Gympie	3·52	65	4·30	9·07
Kilkivan	2·33	56	2·03	4·94
Maryborough	3·88	64	6·35	10·12
Nambour	6·41	39	6·12	10·62
Nanango	2·02	53	1·61	3·67
Rockhampton	2·61	64	0·75	3·00
Woodford	4·80	48	3·99	9·32
Central Highlands.	In.		In.	In.
Clermont	1·64	64	..	0·68
Gindie	1·25	35	..	0·14
Springsure	1·59	66	..	1·75
Darling Downs.				
Dalby	1·43	65	1·16	3·33
Emu Vale	1·45	39	0·76	3·90
Hermitage	1·46	28	0·68	2·72
Jimbour	1·42	47	1·32	3·58
Miles	1·51	50	0·22	2·42
Stanthorpe	1·80	62	1·06	4·69
Toowoomba	2·66	63	3·86	6,28
Warwick	1·68	70	1·77	2·36
Maranoa.				
Roma	1·35	61	0·01	0·78
State Farms, &c.				
Bungeworgorai	1·28	20	0·09	0·72
Gatton College	1·89	35	1·64	4·55
Kairi	4·11	20	..	8·36
Mackay Sugar Experiment Station	4·95	37	2·80	2·57

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—APRIL, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·83	85	69	87	10, 19	63	20	245	9
Herberton	..	78	58	84	9, 10	47	19	200	10
Rockhampton	29·97	86	63	94	9	54	15	75	7
Brisbane	30·03	79	59	89	9	49	17	362	14
Darling Downs.									
Dalby	30·01	79	50	89	9	34	17	116	3
Stanthorpe	..	71	43	80	9	23	17	106	7
Toowoomba	..	73	51	83	9	32	17	346	7
Mid-Interior.									
Georgetown	29·87	91	64	97	6	45	19	11	1
Longreach	29·96	87	58	98	8	44	18	23	2
Mitchell	30·01	80	49	88	8	34	17	7	2
Western.									
Burketown	29·89	91	67	100	9	57	18, 20, 21	..	..
Boulia	29·96	87	60	100	1	47	23	..	..
Thargomindah	30·00	79	57	95	4	48	17	146	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

	June. 1935.		July. 1935.		June. 1935.	July. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·37	5·1	6·46	5·4	6·16	6·52
2	6·37	5·1	6·46	5·4	7·15	7·38
3	6·38	5·1	6·46	5·5	8·10	8·17
4	6·38	5·1	6·46	5·5	8·59	8·50
5	6·39	5·1	6·46	5·6	9·40	9·22
6	6·39	5·1	6·46	5·6	10·16	9·50
7	6·39	5·1	6·46	5·7	10·49	10·20
8	6·40	5·2	6·45	5·7	11·16	10·48
9	6·40	5·2	6·45	5·8	11·48	11·18
					p.m.	
10	6·40	5·2	6·45	5·8	12·17	11·53
						p.m.
11	6·41	5·2	6·45	5·9	12·47	12·28
12	6·41	5·2	6·45	5·9	1·19	1·13
13	6·41	5·2	6·45	5·10	1·54	2·6
14	6·42	5·2	6·45	5·10	2·31	3·4
15	6·42	5·1	6·44	5·11	3·23	4·6
16	6·42	5·1	6·44	5·11	4·18	5·15
17	6·43	5·1	6·44	5·12	5·20	6·26
18	6·43	5·1	6·44	5·12	6·26	7·34
19	6·43	5·1	6·44	5·13	7·35	8·41
20	6·44	5·1	6·43	5·13	8·44	9·45
21	6·44	5·1	6·43	5·14	9·48	10·48
22	6·44	5·2	6·43	5·14	10·52	11·53
23	6·44	5·2	6·42	5·15	11·55	a.m.
24	6·44	5·2	6·42	5·15	a.m.	12·57
25	6·45	5·2	6·41	5·16	12·56	2·1
26	6·45	5·3	6·41	5·16	2·0	3·0
27	6·45	5·3	6·40	5·17	3·4	3·57
28	6·45	5·3	6·40	5·17	4·6	4·48
29	6·45	5·4	6·39	5·18	5·5	5·36
30	6·45	5·4	6·39	5·18	6·1	6·16
31			6·38	5·19		6·52

Phases of the Moon, Occultations, &c.

1 June	● New Moon	5 52 a.m.
9 ,,	☾ First Quarter	3 49 p.m.
17 ,,	○ Full Moon	6 20 a.m.
24 ,,	☽ Last Quarter	12 12 p.m.

Apogee, 8th June, at 7.12 p.m.
Perigee, 21st June, at 6.6 a.m.

Venus will attain its greatest distance, 45 degrees east of the Sun on June 30, and remain above the western horizon 3 hours 28 minutes after it.

When the Sun rises on 1st July, there will be no indication that an hour or two earlier it was undergoing a partial eclipse, a third of its surface being obscured by the Moon in the neighbourhood of Spitzbergen, but only one-fourth at Edinburgh, and somewhat less at Dublin.

Mercury sets at 6.31 p.m., 1 hour 30 minutes after the Sun, on the 1st; on the 15th it sets at 5.48 p.m., 47 minutes after the Sun; Venus sets at 8.4 p.m., 3 hours 3 minutes after the Sun on the 1st; on the 15th it sets at 8.20 p.m., 3 hours 19 minutes after it; Mars rises at 1.48 p.m., and sets at 1.41 a.m., on the 1st; on the 15th it rises at 12.51 p.m., and sets at 1.12 a.m.

Jupiter rises at 3.36 p.m., and sets at 4.48 a.m. on the 1st; on the 15th it rises at 2.37 p.m., and sets at 3.46 a.m.

Saturn rises at 11.43 p.m., and sets at 12.27 a.m. on the 1st; on the 15th it rises at 10.51 p.m., and sets at 11.32 a.m.

The Southern Cross will be on the meridian, 30 degrees above the South-celestial Pole, at position XII. as on the clock-face at 8 p.m. on the 1st, and about 6 p.m. on the 30th. It will also be on the meridian 12 hours later on each of these dates when it reaches VI. in a reversed position head downwards. It will then be out of sight in Queensland, being 2 degrees below the Southern horizon at Warwick, and 13½ degrees at Cairns; when it reaches XII. it will be 58 degrees above it at Warwick, and 46½ degrees at Cairns.

Orion will be setting an hour after the Sun on the 1st, and will be entirely absent from the evening sky almost the whole of this month.

The Scorpion, being directly opposite to the Sun on the 1st, will be rising as the Sun sets.

Virgo, with its wealth of telescopic objects, will be well situated early in the evening, but will reach the meridian about 9 p.m. on the 1st, and 7 p.m. on the 30th, at 8 p.m.; on the 15th Sagittarius, the archer, will be well in view on the eastern side of the sky. The sickle-shaped part of Leo will then be half-way between north and west.

9 July	☽ First Quarter	8 28 a.m.
16 ,,	○ Full Moon	3 0 p.m.
23 ,,	☽ Last Quarter	5 42 a.m.
30 ,,	● New Moon	7 32 p.m.

Apogee, 6th July, at 1.0 p.m.
Perigee, 18th July, at 12.42 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Supplement to the "Queensland Agricultural Journal," August, 1935.

QUEENSLAND AGRICULTURAL JOURNAL.

VOL. XLIII. PARTS 1 TO 6.

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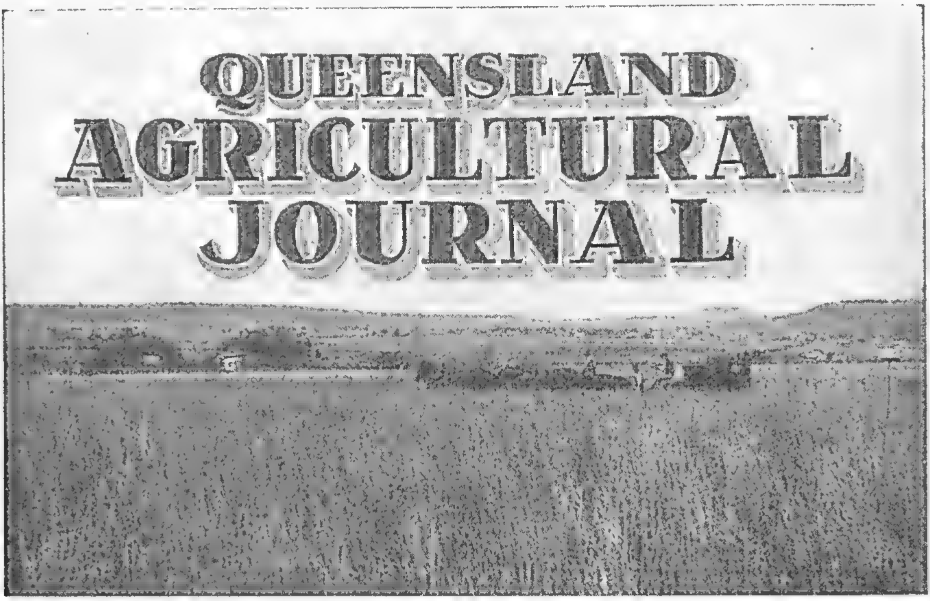


VOL. XLIV. 1 JULY, 1935. PART 1

Event and Comment.

The Journal.

WITH this issue we are entering on our thirty-ninth year of publication. The "Queensland Agricultural Journal" was founded by the late Hon. A. J. Thynne, then Secretary for Agriculture and Stock, in 1897, and made its first appearance in July of that year under the able editorship of the late Major A. J. Boyd, F.R.G.S. It has been published without a break ever since, and this number is the first part of the seventy-seventh volume. It is agreed generally that the Journal has had an important influence on the development and progress of rural industry in this State. A high standard was set by its first editor, as revealed by reference to earlier volumes. Every effort has been made to maintain that standard, which is based on a general policy in consonance with progressive agricultural thought, development, and practice. As a farmers' magazine, the Journal has a definite value for the man on the land; and, while its circulation is large and increasing continually, there is no reason why it should not be on every Queensland farmer's bookshelf. Readers would do a good turn to their neighbours who are not already subscribers by bringing the Journal under their notice, especially as the subscription fee—one shilling a year—is merely nominal. As an interesting, informative, and authoritative publication, it should have a direct appeal to the practical farmer and grazier.

Rain.

IN Queensland, the greatest event of the month was the widespread fall of heavy rain from the Gulf country down to the Central-West, which occurred in the last week of June. The precipitation, with registrations ranging from 2 to 9 inches, was due to the unexpected persistence of tropical influences. After the rains came a period of unusually mild weather, so further losses of sheep, which would certainly have occurred had a cold snap supervened, were to a large extent happily averted. Further falls are, of course, required to relieve substantially the position in the pastoral districts, but the measure of temporary relief already received will, in any case, be of immense benefit. Already herbage is appearing above ground, and over a wide area, where grasses had not been entirely eaten out, a green shoot is showing. The growth of herbage on the country where 3 or more inches fell should, at least, carry stock over to the spring, or, possibly, to the period of early thunderstorms, which usually commences in October. Graziers who were hand-feeding their stock before the rain came are, however, continuing the practice until the new herbage is available. While it cannot be said that the prolonged dry spell from which the Central and North-West were suffering has been definitely broken, the June rains have been immensely beneficial to the pastoral industry, and the improvement in the outlook is reflected in firmer stock values and fewer sale transactions.

Problems of the Pastoral Industry.

AT the Blackall Conference, which was representative of grazing and other rural interests concerned with the welfare of the pastoral industry and convened by the Minister for Agriculture and Stock (Hon. Frank W. Bulcock), many important problems were discussed. Opening the conference, Mr. S. Blackstock (chairman of the Blackall district branch of the Graziers' Association) said that it was probably one of the most important meetings ever held in the western country, as it involved bringing before the Government some of the most vital problems which to-day faced the grazing industry. He complimented Mr. Bulcock on the interest he was taking in graziers' difficulties.

Replying to statements made in the course of a discussion on taxation readjustment, Mr. Bulcock said that it was necessary to consider to what degree the finances of the State could be allowed to be eroded. To arrive at some unanimity between the States and the Commonwealth, a conference of taxation commissioners was held at Canberra in June, when this question was brought forward. As an outcome, he believed that a recommendation would be made that would go a long way towards meeting the graziers' wishes. Amidst applause, Mr. Bulcock added that it was his conviction that there must be some averaging of losses to overcome the grave position. After dealing with other matters relating to the scope and incidence of taxation, and to land rentals and freight rates, the Minister outlined at length Government proposals in regard to stock routes. It was believed that a policy was possible under which all-season routes could be provided. There was also a belief, he said, that national stock routes could be provided in such a way that they would be of permanent benefit and an asset to the districts through which they passed. The aim of the Government would be to devise a system of adequate routes well protected and supplied with water. Other aspects of the graziers' problems received the Minister's sympathetic consideration.

Drought Insurance.

MR. BULCOCK made a forceful plea to the conference for the formulation of a practical scheme of drought insurance. This State, he said, had gone through successive drought cycles, and dry periods were of inevitable recurrence. He had arrived at the conclusion that it would be impossible with the present resources and finance of the pastoral industry to make provision for conserving the lives of all the sheep in Queensland, but it must not be forgotten that while they were striving in times of plenty to raise the quality of their stock, in times of drought it was impossible to sustain the ratio of advance being made; and to that degree the industry was being severely handicapped.

In sketching a tentative scheme, the Minister urged the graziers to give it serious consideration. Any weakness in it would thus be discovered and rectified. A further conference would be convened in Brisbane in August to deal with the proposals finally. Such a scheme, he said, would have to be adopted eventually and made compulsory for all graziers owning sheep. The scheme which he had been investigating for the past six months provided for the purchase and storage of fodder on normal markets at normal prices. During the 1927 drought the cost of feeding sheep averaged a shilling a head a month on the basis of £10 a ton for lucerne and 6s. a bushel for maize. If bought on a normal market, this cost could have been halved. The return per sheep in normal times averaged about 10s. a head. Minor droughts occurred about every five years, and major droughts about every ten years. Queensland flocks averaged, in the aggregate, 20,000,000 sheep over a decade, and, if assessed at 3d., would return a capital annually of £250,000, or, say, £1,000,000 in four years, which could be held in trust. Such a scheme would need very material liquid assets. This money could be used to buy feed in normal times, and could be handled by a board controlled by the graziers, with, probably, a representative of the Treasury to advise regarding investments, and a representative of the Department of Agriculture and Stock to act as a liaison officer. When a grazier became a beneficiary under the scheme, his payments would cease until the climatic conditions in his district made it possible for him to again contribute. If wool fell below a certain figure, the amount payable would lapse and, if prices improved, would be made up until an average of 3d. a head was realised. On the question of storage, the Premier (Hon. W. Forgan Smith) had given him a definite assurance that fodder so stored in good seasons as a drought insurance would be conveyed in dry times on the railways at starving stock rates. The scheme provided for storage depots at stragetic points in the railway system, and also at places remote from railway centres, such as Tambo and Augathella.

White Louse of Citrus.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

THE white louse, *Chionaspis citri* Comstock, occurs on citrus trees throughout Queensland and is one of the commonest insect pests of such trees in this State. In well-tended orchards the species rarely assumes major importance, but where the attention given to trees is inadequate white louse quickly asserts itself and considerable damage to the trees soon follows. In southern parts of the State almost every garden citrus tree carries a large colony of the insect, and the health of the host plants is consequently greatly impaired. The pest is generally more in evidence in dry than in wet times, and similarly is of more importance in inland dry areas than elsewhere.

Description.

As is the case with most species of scales, the insect itself is exposed to view for but a very short part of its life cycle, the remaining part being passed beneath a covering which is usually termed the scale. The scale of the female (Plate 1, fig. 2) is dull brown or almost black in colour, with grey margins and with small brown or yellowish areas which are rather prominent at the anterior end. It is roughly triangular in outline with the sides somewhat curved, the general contour suggesting the shape of a mussel. Along the central dorsal line runs a ridge from which the sides slope away to the margins. Generally, on the trees, this ridge is difficult to distinguish as the scale is typically coated with fine particles of dust and other foreign matter. The creamy coloured adult female insect (Plate 1, fig. 3), which lies beneath the scale, is elongate and possesses a deeply segmented abdomen which widens towards the posterior end.

The male scale (Plate 1, fig. 4) is much more conspicuous than the female, and it is from the former that the vernacular name is derived. The scale of the male is snow white and rather floury in appearance, and three ridges run practically the entire length of the scale and are generally quite conspicuous. The adult male (Plate 1, fig. 6), which is rarely seen, is a very delicate light yellow two-winged insect. The young of the two sexes cannot be separated on appearances and are elongate in shape, light yellow in colour, and capable of crawling about the plant very quickly. The length of the full-grown female averages about one-sixteenth of an inch and that of the male about one twenty-fifth of an inch.

Life History and Habits.

In Queensland white louse breeds practically continuously and young may be found at any time of the year, although during winter their numbers are greatly reduced and natural mortality is then very high. It has been found that the young produced by any one female may emerge over a period of from three to six weeks, and as the females require approximately but sixty-five days to complete their development there is no well-defined succession of generations; hence from the point of view of control a knowledge of the life history does not give much assistance in this case. A great preponderance of one stage may, of course, be found in any one orchard at a particular time, and the application of artificial control measures should therefore always be preceded by a close inspection of the colonies.

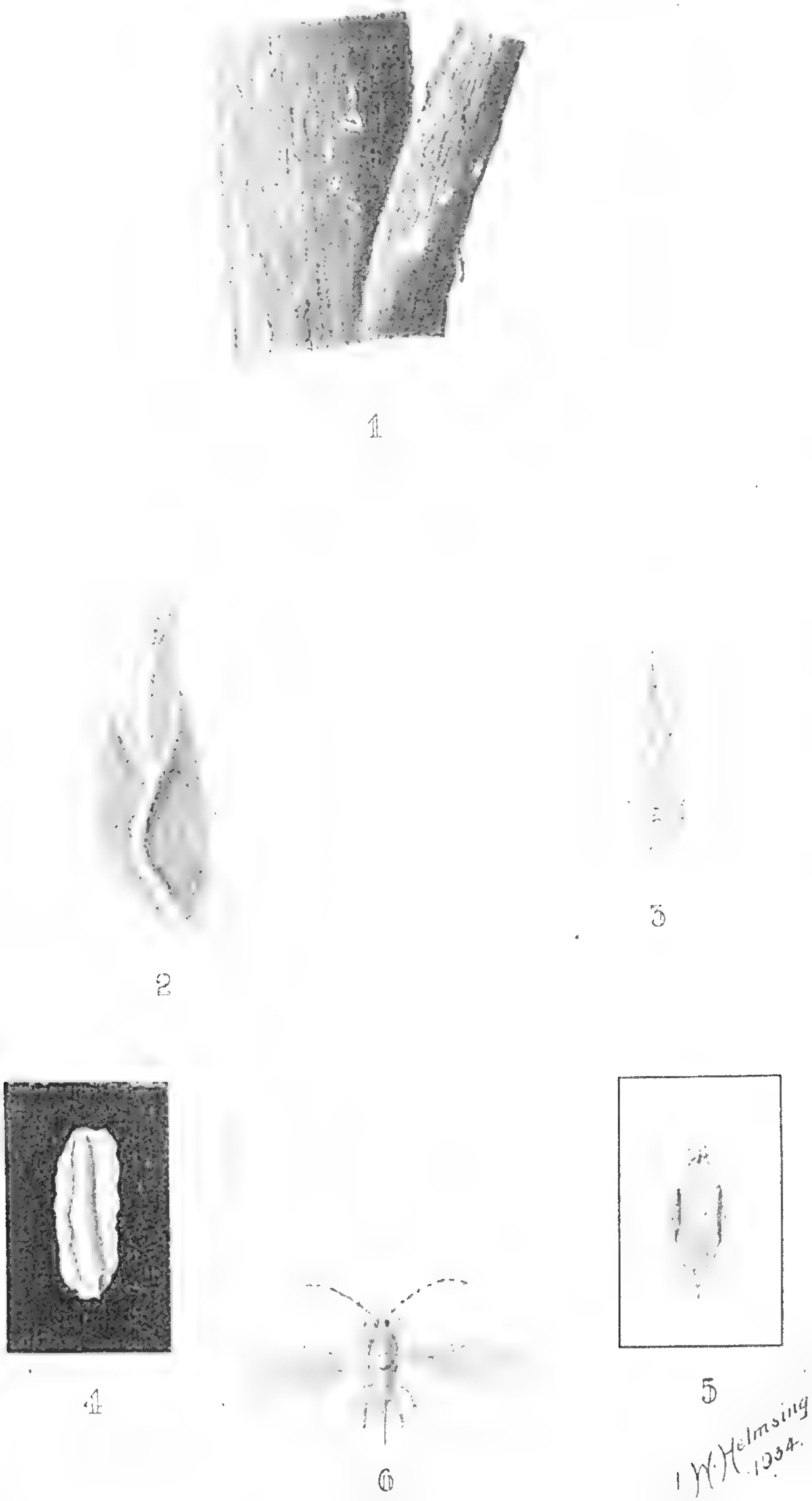


Plate 1.—White Louse, *Chionaspis citri* Comstock.

Fig. 1.—Male scale on bark x 3.
Fig. 2.—Female scale x 24.
Fig. 3.—Adult female x 24.
Fig. 4.—Male scale x 24.
Fig. 5.—Male pupa x 24.
Fig. 6.—Adult male x 24.

The young for the most part settle down in depressions in the bark after a short migratory period. All aerial parts of the tree may be affected, but the largest colonies are almost always found on the trunk and main limbs. Though the fruit, twigs, and leaves are susceptible, white louse is generally found on these parts only when the tree is in poor condition. Occasionally, however, a quite healthy tree will be found to carry a little white louse on the extremities of a small number of branches, but this is never of much moment. As the males are so much more numerous than the females they are usually conspicuous as white areas on the trunks or limbs when appreciable colonies are present.

The attacked parts are quickly weakened and typically the bark becomes very hard and soon cracks (Plate 2). The cracks so produced provide an excellent opportunity for the entry of borers and other harmful organisms, and if produced towards the base of the trunk gumming very often follows. The gumming is, however, by no means confined to this part and it may occur on any woody part of the tree. All varieties of citrus are subject to attack, but mandarins as a rule do not harbour nearly such large colonies as do comparable oranges or lemons.

Natural Enemies.

There are several important natural enemies of white louse, and among these are a number of small chalcid wasps which frequently help considerably in checking the pest. The most important natural enemy, however, is a moth (*Catoblemma dubia* Butl.), the larvæ of which are very commonly associated with colonies of the pest, and in drier areas white louse colonies are seldom free from its attentions. The larvæ are creamy white in colour and work beneath a web in which are entangled the scales of the insects on which they have fed. The cocoons of creamy white webbing enclose the small brown pupæ, to which the larvæ transform when full grown. These pupæ, in their turn, give rise to the adult moths which measure approximately three-quarters of an inch across the outspread wings. Their forewings are brown with lighter margins which appear bluish at times. This useful predatory insect is generally to be found in largest numbers towards the end of summer, and it is thus always advisable to examine colonies for its presence before applying control measures at that period of the year.

Artificial Control.

White louse is not a difficult pest to control, but it must always be remembered that trees in poor condition are much more susceptible to attack than vigorous ones, and therefore it is necessary to attend to the general health of the tree if lasting results are to be obtained.

Hydrocyanic acid gas is very effective against the pest, and control by the use of this fumigant may be obtained at any time when fumigation is practicable.

For the most part the most satisfactory method of combating white louse is by the use of lime sulphur. Although this scalicide is useful at other times the best time for its application is in the late winter. It will be found that by using lime sulphur at a strength of about 1 to 12 just prior to blossoming time, satisfactory results will be obtained. At this time, which will generally be late in July, late maturing varieties such as the Valencia Late may still be carrying fruit, but this does not matter greatly, as in general only the inside parts of the trees

PLATE 2.

White louse infestation on bark. Note predominance of males, presence of cocoons of predatory moth larvæ, and splitting of bark.

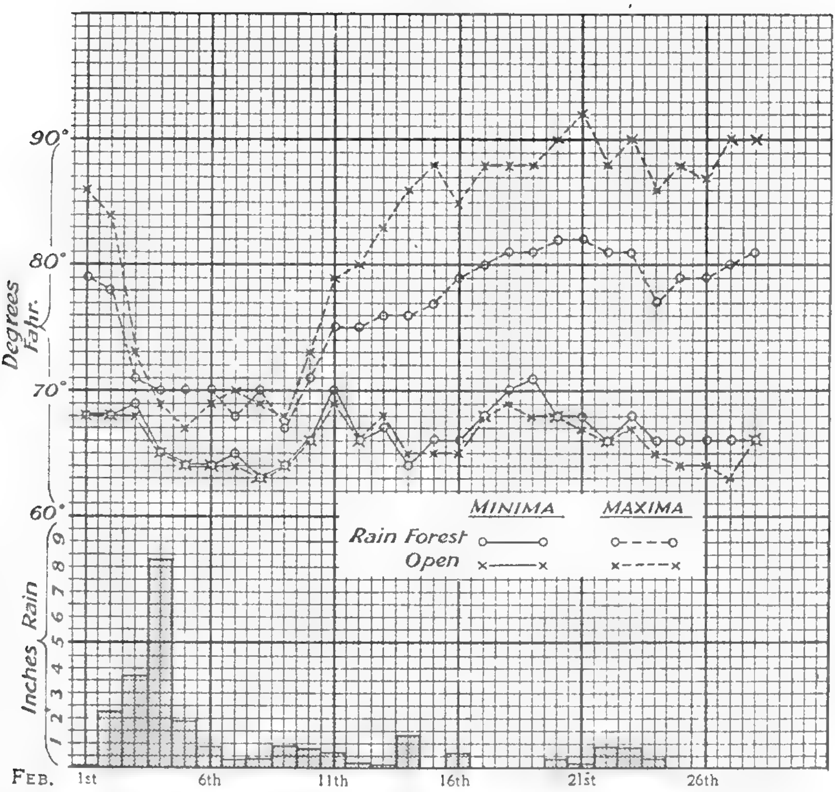
need be sprayed. If the crop has been removed, however, it is recommended that the whole of the tree be sprayed, as in addition to its scalicidal effect the lime sulphur has considerable value against other pests and diseases at this time.

The resin-caustic soda-fish oil mixture is also very effective against white louse and may be employed for the control of this pest during the cooler months. Oil sprays also have some value against white louse, but they do not give nearly such good results as any of the three previously mentioned scalicides and therefore are not recommended for use against this pest.

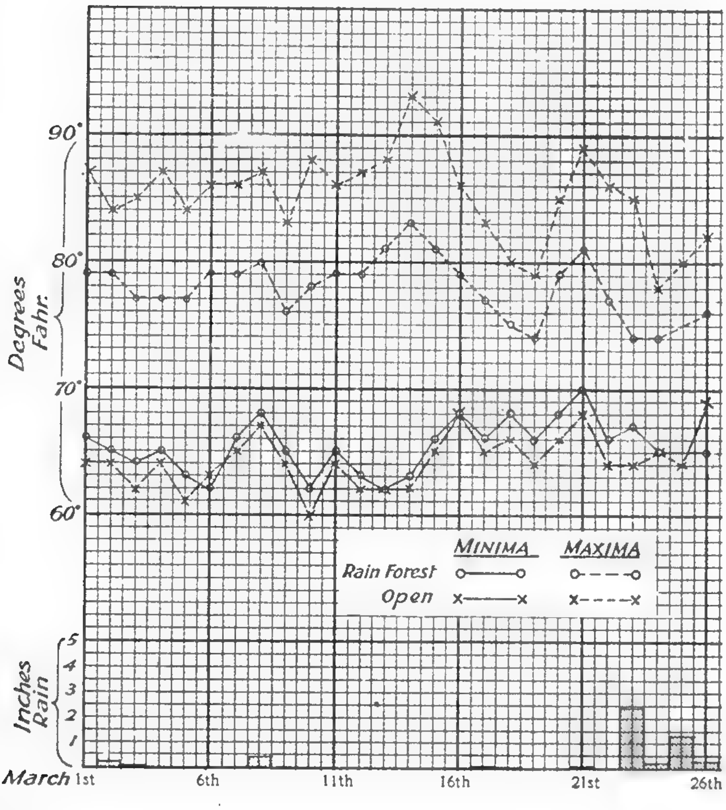
PLATE 3.—ON THE ROAD TO TAMBORINE.

On a gentle upward grade, this highway winds through primeval rain forest to the summit of Tamborine Mountain, a broad plateau of great fertility commanding extensive views over some of the wildest parts of the Macpherson Range, and all the south coastal country—so rich in its river-divided dairy lands—from Point Danger to Stradbroke Island and Moreton Bay.

GRAPH I.



GRAPH II.



The Pinhole Borer of North Queensland Cabinet Woods.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

(*Continued from page 548, Volume XLIII.*)

CLIMATIC FACTORS.

TO pass from open cleared country into the heart of the rain forest involves a distinct transition from one habitat to another. Though the change is so apparent, a definition of the differences is a matter of some difficulty though they may be of some moment in the insect economy. Actually the rain forest environment is not a unit. Within it are differences such as those presented by intact virgin forest, clearings of a temporary nature due to the collapse of mature trees, and a third type afforded by cleared tracks some of which are disused while others are in constant service as feeder roads for areas being logged. Even in a stretch of unlogged virgin rain forest there are differences of a vertical nature, the habitat in the lower 20 or 30 feet being quite distinct from that in the upper reaches of the trees.

In this special study it seemed obligatory in view of some obvious limitations on Crossotarsan activity to establish the main distinctions between two contrasted habitats—

(*a*) In open country adjacent to rain forest;

(*b*) In the rain forest under canopy.

Clearings in the rain forest so far as temperatures are concerned share some of the characteristics of the first of these and may be regarded as transition habitats between the two. Within the vertical range of the forest similar gradations occur, hence the two habitats chosen for comparison represent the extreme ends of a chain along which are strung the wide variety of habitats offered to living forms in and adjacent to the rain forest.

At both stations similar apparatus was used, comprising maximum, minimum, wet and dry bulb themometers. At one the records of the forest station were available, and at the other the necessary thermometers were placed under complete canopy. For the satisfactory functioning of the wet bulb thermometer access to air currents is necessary, hence the apparatus could not be erected in the heart of the rain forest where such currents are slight. Advantage was, therefore, taken of a belt of regenerated maple silkwood which abutted on to open country, the thermometer being placed just sufficiently far from the open to ensure complete canopy without totally excluding air currents. Records were kept over approximately two months during 1933, and are illustrated graphically and correlated with rainfall records in Graphs I. and II. The essential conclusions were confirmed in 1934 and can be discussed seriatim:—

(*a*) The various records obtained cover the months of February and March, 1933, and show the differences in the temperature minima of the rain forest and open habitats to be slight. They range between 60 deg. F. and 71 deg. F. February was a particularly wet month with some twenty wet days, while March only received scattered storms. Both sets of data indicate that the lower minima are linked up with

precipitation, but the relationship is hardly sufficiently clear to warrant definite conclusions on the point. The most interesting feature is the close approximation of the minima in the two habitats. In the drier month, March, the rain forest minima were always less than 4 degrees Fahrenheit above those in the open, while in the wetter month, February, the two records fit closely together during the first wet fortnight but show a tendency to separate during the drier periods. Perhaps this can be explained by the surface evaporation in the two habitats and the higher humidities at the lower levels of the rain forest. The protection afforded the surface soil and incidentally the lower atmospheric levels of the rain forest by canopy apparently tends to keep the minimum temperature higher than in the exposed open country, except under conditions of general precipitation when such differences tend to disappear.

(*b*) The ordinary disposition of the temperature maxima is best illustrated by the records for March when, apart from occasional storms, the weather was comparatively fine. From these it will be seen that the canopy maxima during fine weather closely follow those of the open but at a level of some 7 deg. F. to 10 deg. F. below it. Thus, in the open the maximum temperatures range from 78 deg. F. to 93 deg. F., while in the rain forest they lie between 74 deg. F. and 83 deg. F. The canopy thus screens the heart of the forest from the extremes of heat normally encountered in the open during the afternoon. The prolonged wet period during the first fortnight of February brings the maximum temperatures in the open and rain forest environments close together and eliminates the normal disparity between the two. In this case the perpetual cloud blanket influences the whole environment in much the same way that canopy does the rain forest ordinarily. Thus, in both rain forest and open habitats the maximum temperatures during wet weather are depressed well below the level of either under fine weather conditions—about 88 deg. F. in the open and 80 deg. F. under canopy—to below 70 deg. F.

It should be noted that the diurnal variation in fine weather as represented by the differences between the maximum and minimum temperatures is much smaller in the rain forest than in the open. In the open the normal diurnal variation is 25 deg. F.; in the rain forest, 15 deg. F. This is perhaps the most significant contribution of canopy to the forest floor habitat.

(*c*) Relative humidities during February and March were usually above 70 per cent. In the prolonged wet period of early February the atmosphere was almost completely saturated and ordinary deviations proper to rain forest and open habitats in fine weather were obliterated. Normally the humidity of the canopied area is higher than that in the open, but in both the atmospheres may become saturated at night. The general movement of humidities is similar to that of the temperatures already discussed, i.e., that the humidities approximate during the night, as do the temperature minima, and separate widely during the day.

The Significance of Canopy.

In discussing the activity of *C. grevilleæ* it has been noted that mass infestation of a log is confined to special periods of the day. The hours of activity on the wing turn irregularly round the period 10 a.m. to 2 p.m., insects rarely arriving at the log earlier than this though they may do so later in the afternoon if conditions are suitable. The

time limits are taken from an ordinary fine day in which open temperatures ranged thus:—

Time.	Temperature.	Time.	Temperature.
9 a.m.	78 deg. F.	2 p.m.	86 deg. F.
10 a.m.	82.5 deg. F.	3 p.m.	89 deg. F.
11 a.m.	83 deg. F.	4 p.m.	90 deg. F.
12 a.m.	85 deg. F.	5 p.m.	85 deg. F.
1 p.m.	85.5 deg. F.		

Hence it is inferred that mass infestation does not take place until temperatures have risen to 82 deg. F. or thereabouts. Temperatures below this tend to inhibit the flight of *C. grevilleæ* and thus the faculty for initiating new infestation. If temperature is also an upper limiting factor it might be inferred that flight does not take place when temperatures rise above 86 deg. F., but high log surface temperatures operate in the afternoon and confuse observations. At any rate the lower limit of 82 deg. F. is of most interest at the moment. No two days are alike, however, and a cloud blanket of a temporary nature may prolong the flight period or prevent it altogether in so far as temperatures are effected. Thus a completely cloudy day may prevent any activity at all, while a fine morning followed by overcast conditions in the afternoon may prolong it.

Observations so far discussed are all concerned with logs on ramps within the rain forest area or in clearings caused by the fall of a tree. The known variation in temperatures at various parts of the rain forest suggested the comparison of infestation on logs hauled under canopy when cut and others left in rain forest clearings. In March, 1933, a walnut-bean tree was felled and a section cut from it immediately rolled into the nearest canopy, some 12 yards away from the trunk of the tree. Equivalent sapwood areas were then exposed on both the canopied log and the parent tree. After exposure to the first diurnal period of Crossotarsan activity, for every single burrow initiated in the log section under canopy, thirty-two were initiated on the parent tree. The difference was maintained through the whole period of susceptibility and has since been confirmed by larger experiments with a number of commercial logs.

Complete canopy in which the undergrowth has been removed to permit the handling of logs invariably allows some sunlight to reach the forest floor, for gaps of various dimensions occur in the overhead tiers of the rain forest. Should the gaps be small and the pencils of sunlight not more than two or three square feet in cross-section, temperatures are unaffected. Larger beams with a cross-section of five to seven square yards may, however, raise temperatures some two or three degrees above those in the surrounding shade. The influence of sunlight can never be great in reasonably complete canopy owing to the movement of the sun relative to the overhead gap. The more evident effect is a slight rise of temperature in the stratum of air through which the beam passes with little diffusion beyond it.

Canopy temperatures already recorded are all taken at a height of 5 feet. Nearer the forest floor they may be much lower, and the position is illustrated by the following series of contemporary readings:—

In the open	90 deg. F.
In teamster tracks	87 deg. F.
Under canopy, 8 ft. from the ground	78 deg. F.
Under canopy, 4 ft. from the ground	78 deg. F.
Under canopy, 2 ft. from the ground	77 deg. F.
Under canopy, 6 in. from the ground	74 deg. F.

The sharp drop in temperature near the ground is doubtless due to the cooling effect of the humus-impregnated forest floor with its normal high moisture content.

Under ordinary logging conditions the superficial drying of sap wood surfaces hinders burrow initiation by *C. grevilleæ,* probably by preventing any further liberation of the chemotropic stimulus which first attracts the insect. Given fine weather at and subsequent to the felling of a tree, few burrows are initiated after the lapse of a week, the greater part of the infestation being completed in the first day. Under wet weather conditions infestation may be deayed for some weeks, for temperatures during wet weather are normally too low for insect flight and thus unfavourable to mass infestation. It is thus difficult to say precisely when an individual barked log ceases to be vulnerable without personal inspection. Logs under canopy dry out much less quickly than those in the open exposed to the sun; hence while logs can be protected from severe Crossotarsan attacks by canopy shelter they may still be attacked if discharged into rain forest camps before superficial drying has taken place. Surface changes on logs held under canopy are slower than on logs in the open or rain forest clearings in any single set of weather conditions. Hence if weather conditions are good barked logs should not be removed from canopy until a fortnight after felling, though a longer period may be desirable. In wet weather a month or six weeks is preferable.

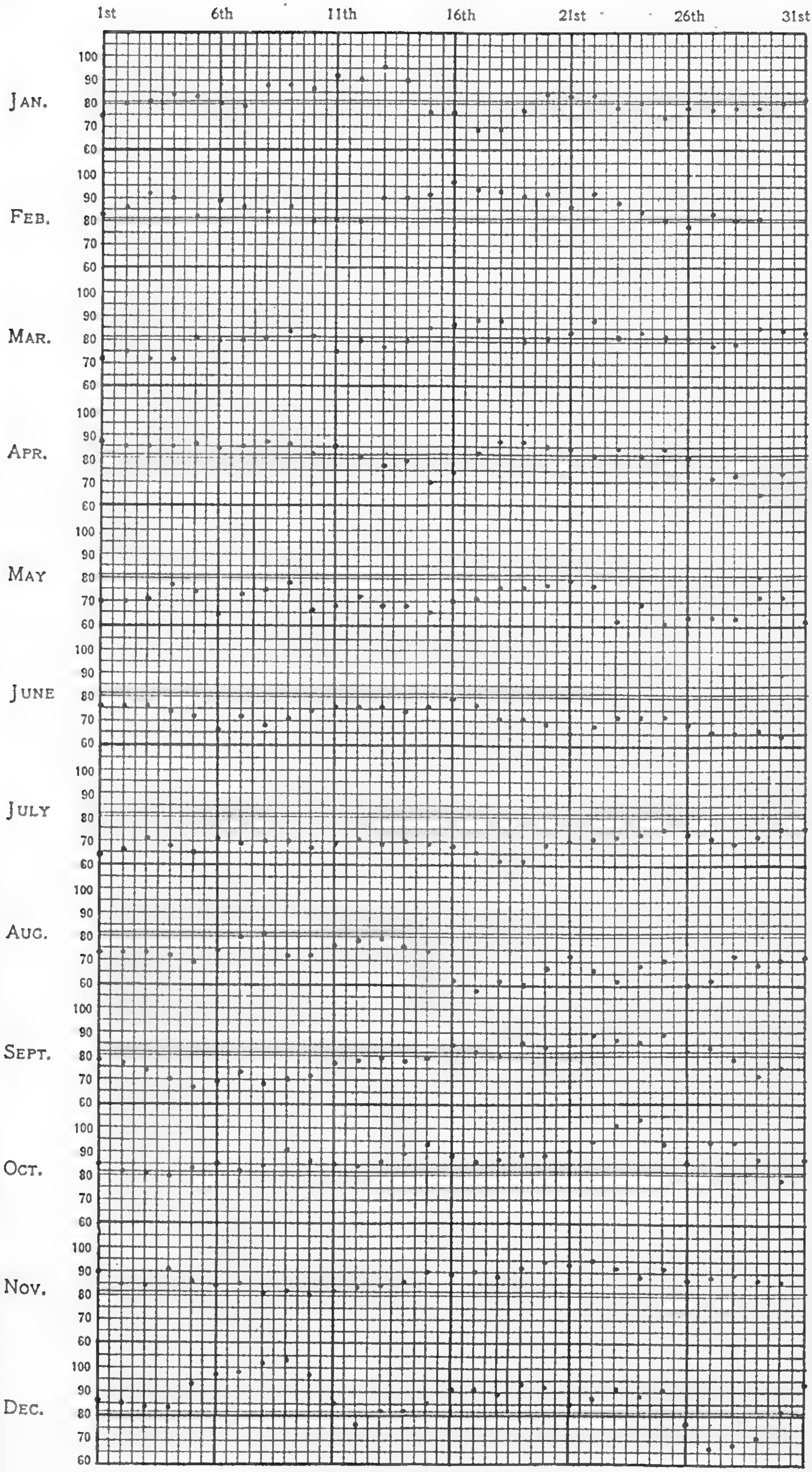
Seasonal Incidence.

The pinhole borer, *C. grevilleæ,* in common with most platypodids is more important in summer than in winter. Greater numbers are then on the wing and susceptible material is more subject to attack. As temperatures have so much influence on the activity of the insect, an attempt has been made to correlate its seasonal movements with known temperature requirements. The daily maximum temperatures for the complete year 1932 have thus been analysed from the Gadgarra records (Graph III.) with this end in view.

Daily maximum temperatures for each month are linked up on the graph and the observed temperature at which mass infestation begins, i.e., 82 deg. F., superimposed. Whenever the daily temperatures have exceeded this limit it is reasonable to suppose that, for part of the day at least, infestation may have taken place; hence while in no one month was the temperature suitable for mass infestation every day, in three—namely, February, October, and November—only odd days were unfavourable. For the five months January, March, April, September, and December the temperatures were for the most part favourable, but sometimes a fortnight might pass without attack. During the four essentially winter months infestation was improbable, the maximum temperatures being below the level required for Crossotarsan activity. It is perhaps unwise to assume that when the maximum temperature in any one day rises above 82 deg. F. infestation is inevitable. For ordinary purposes it may be presumed that when temperatures in any one day only slightly exceed 82 deg. F. the period during which the insect is active will be short. The converse will also be true.

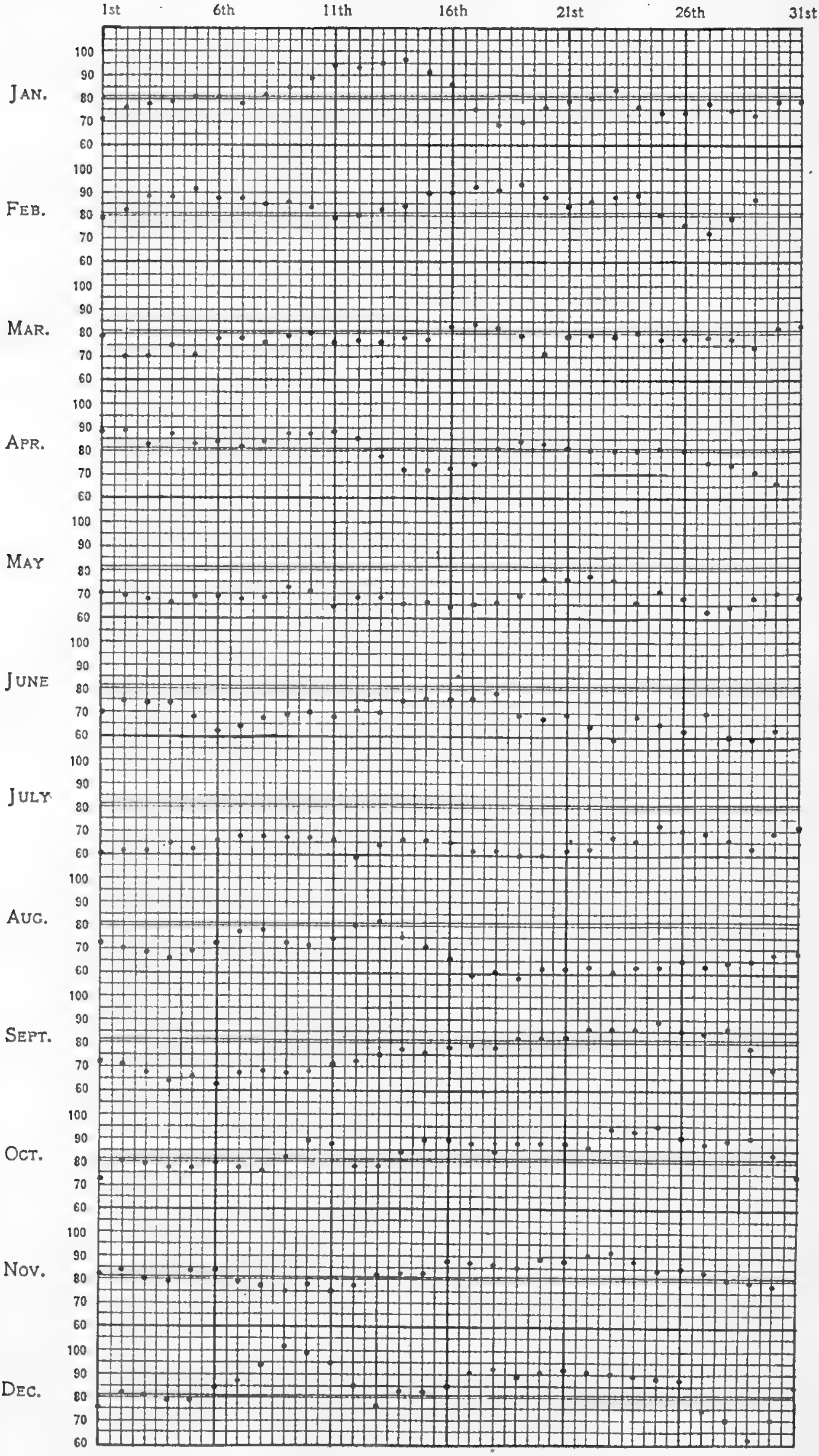
Another interesting point emerges from the data. Sometimes for a week or a fortnight during the summer months daily maximum temperatures may not rise above 82 deg. F. Such periods of relatively

GRAPH III.



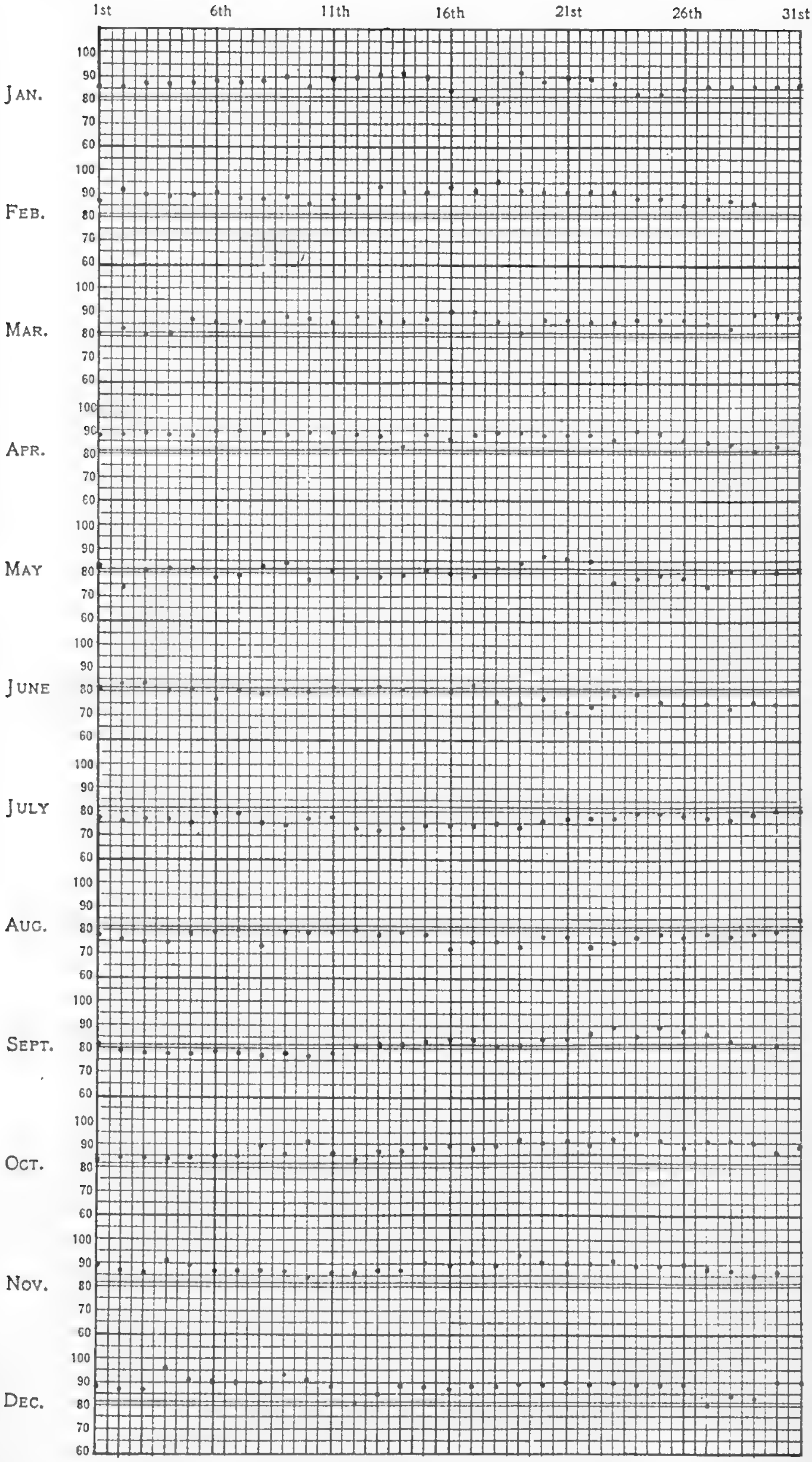
Gadgarra—Maximum Temperatures.

GRAPH IV.



Ravenshoe —Maximum Temperatures.

GRAPH V.



Cairns—Maximum Temperatures.

low temperatures are invariably due to cloud effects with or without rain, prolonged wet periods being common at this time of the year. Theoretically, then, logs may be left in the rain forest environment during wet weather without any great danger from attacks by *C. grevilleæ.*

These conclusions agree with the general experience in North Queensland. Normally infestation is heavy during the spring and summer months, but even within these logs are subject to considerable variations in the amount of insect attack. The frequent suppression of infestation during the summer months in all classes of timber has often been ascribed to precipitation, but it is now apparent that the determining factor is temperature, and the influence of rainfall is therefore an indirect one.

The economic significance of the pest has, as yet, been chiefly studied on the Tableland where cabinet woods are cut in appreciable quantities. The relevant data is especially applicable to this area, but the importance of the insect suggests a comparison between three districts in which logging takes place in North Queensland. These merge into each other, but for purposes of discussion may be designated:—

(*a*) The coastal belt comprising the rain forest clothing the coastal side of the range between Cairns and Cardwell; temperatures vary within comparatively narrow limits and humidities are high.

(*b*) The upper Tableland, an irregular plateau of elevated country behind the Innisfail-Tully part of the coastal range; temperatures show a wide diurnal variation and humidities are much less than on the coast.

(*c*) The Tableland, which includes the country behind the coastal range with Malanda as its centre; the climate is more or less intermediate between those of (*a*) and (*b*).

For comparative purposes the maximum temperatures for 1932 from recording centres within each area (Cairns, Ravenshoe, and Gadgarra; Graphs V., IV., and III.) are linked and the minimum temperature suitable for mass infestation superimposed on the graphs. Table I. shows the number of days in which log infestation was theoretically possible and allows the inference that temperature conditions on the coast are normally more favourable to infestation than those on either of the Tablelands. For eight months of the year—September to April—infestation was possible in all three centres, while the four remaining months almost prohibit attack. This latent period for 1932 is probably much longer than usual, for the winter chanced to be one of the most severe on record, but the outlined parallel between the seasonal incidence of the pest and temperature records suggests a danger of greater borer losses on the coast when rain forest there is systematically felled.

In 1932 the number of days in which infestation was possible in each district was as follows:—

(*a*) Coastal belt	235 days.
(*b*) Upper Tableland	122 days.
(*c*) Tableland	158 days.

TABLE I.

RECORD OF DAYS IN EACH MONTH IN WHICH INFESTATION COULD TAKE PLACE DURING 1932.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Coastal Belt	29	28	27	29	10	5	..	1	16	31	30	29	235
Upper Tableland ..	10	21	5	14	..	..	..	1	10	20	19	22	122
Tableland	13	21	14	18	..	..	..	..	10	29	27	26	158
Maximum Possible ..	31	28	31	30	31	30	31	31	30	31	30	31	..

It is apparent that *C. grevilleæ* may still be active on the coast when it is quiescent elsewhere where temperatures are lower.

[TO BE CONTINUED.]

PLATE 4.—PARK-LIKE COUNTRY, NEAR DALBY.
The brigalow provides cool summer shade and shelter from winter's cold westerlies.

Angular Leaf Spot of Cotton.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

THIS disease is responsible for considerable economic loss in many cotton growing countries. It is believed to have been present in Queensland for a number of years, but until recently has not been regarded as of serious consequence in this State. However, during the past season it has been suspected of causing marked deterioration, and consequently these notes have been compiled in order that those concerned may become familiar with the various aspects of the disease.

Symptoms.

The name indicates the type of lesion produced on leaves and bracts. Infection points are at first translucent dots. They then spread and darken, but are usually limited by the veins and veinlets, so that finally they are dark brown angular spots readily distinguished from the circular spots caused by various fungi. Under wet conditions the infection may spread along the veins and down the petioles to produce elongated dark areas on the stem. Infection may also take place on the stem directly, but it is doubted whether it occurs on any but the youngest stem tissues except by way of a wound or a petiole. This stem phase of the disease is known as blackarm and may result in the breaking of the affected branch and death of all distal portions. It is very destructive in countries growing cotton under humid conditions.

Infection of the flower or very young boll results in shedding, but on the partially developed green boll produces a dark shiny water-soaked area or grease spot. It may remain in that stage, perhaps just penetrating to the lint, or if weather conditions are favourable it will spread and become a sunken brown area involving a considerable portion of the boll, in which case the underlying lint becomes brown stained and in extreme cases wet and rotten. The later stages of rot are considerably varied due to the entrance of secondary organisms such as various species of fungi which may result in the complete destruction of the boll.

The early stages of the boll infection are similar to those of anthracnose (a disease which is not known in Queensland) and somewhat similar to the effects of sucking bug punctures. The later stages, particularly when secondary rots intervene, closely resemble fungus rots either of a primary nature or following insect attack. The boll spot can only be definitely identified when it is found in association with the typical leaf symptoms or by microscopic examination.

Cause.

The disease is caused by bacteria, the causal organism being known to science as *Pseudomonas malvacearum*. This is a minute rod-shaped organism about one ten-thousandth of an inch in length. It can swim in moisture by means of a thin whip-like flagellum at one end several times as long as the main part of the organism. It has no actual resting (spore) stage, but on slow drying secretes slime which protects it from dessication and serves the same purpose as the resting stage of the spore-forming bacteria. It is highly sensitive to exposure to sunlight or sudden drying when in the active state. It develops and multiplies most rapidly at a temperature of 25°-30° C. (77°-86° F.) with a maximum

of 36°-38° C. (96°-100° F.), a minimum about 10° C. (50° F.), and thermal death point of 51°-52° C. (124°-126° F.).

Contributing Conditions.

The bacteria are carried on seed from affected crops and the cotyledons (seed leaves) become infected when leaving the seed coat. This infection takes place most readily when soil conditions are suitable; little of this primary infection occurs at soil temperatures below 20° C. (68° F.) or above 32° C. (90° F.), being at a maximum between 24° and 26° C. (75°-79° F.). Also, with an amount of soil moisture only just sufficient to germinate the seed, little or no primary infection can occur.

The absence of this early infection, however, is often of little advantage owing to heavy later infections blown from neighbouring crops or from the refuse from infected crops of the previous season. Once the disease is established in a crop the bacteria are carried by driving rain and in infected debris. They require free moisture such as is provided by rain or dew for actual penetration, which takes place by means of the stomata or breathing pores. The spread of the disease is favoured by high temperature and high relative humidity, though outbreaks of blackarm and boll rot have been recorded in comparatively dry weather. The leaf and boll spotting occurs on weak and strong plants equally, but there is much less breaking of stems from blackarm in a robust crop. Waterlogging of cotton paddocks is particularly conducive to blackarm, both by weakening the host and providing those humid conditions necessary for the parasite.

Economic Importance.

In countries where the blackarm phase of the disease is of frequent occurrence the resultant loss of crops is obvious and heavy. Such losses have not been known to occur in Queensland. The leaf spot stage does not result in any measurable loss, though the presence of any defect in the economy of the plant should not be entirely ignored. With the boll spot, however, the position is more serious. In addition to the entire loss of some bolls the lint in others is reduced in value. It would be very difficult to estimate the loss which occurs locally from this cause, particularly as the injury somewhat closely resembles that due to sucking bug attack and in the later stages of the disease also to fungus boll rots.

Control.

Once angular leaf spot has appeared in a crop there is no known economic method of preventing its spread. The incidence of the disease will depend on the susceptibility of the cotton and the environmental conditions, particularly temperature and humidity. The latter cannot be varied except by the provision when necessary of adequate drainage or, when irrigation is used, by the cautious use of water. Differences in the susceptibility of cotton varieties have been recorded, and in general it can be stated that long staple Egyptian and Sea Island are the most susceptible. There is, however, insufficient data to make any recommendations with respect to planting resistant varieties.

The only available method of control under ordinary circumstances would appear to be the prevention of the introduction of the causal organism to the crop. Three methods of entry have to be guarded against, namely on the seed, on debris from a prior crop, or from a

neighbouring crop. Infection from the seed can be prevented by using seed from a disease-free crop. The latter is possible as the bacteria are carried on the outside of the seed. Such disinfection can be attained by delinting the seed with sulphuric acid, washing it and treating it with corrosive sublimate (1: 1,000) for fifteen minutes and again rinsing before drying and planting. This method is cumbersome, and in the hands of inexperienced persons somewhat risky, so attempts have been made to find simpler effective and non-injurious disinfection processes. Of these the most promising are the mercurial dusts. Varying results have been reported for some of these materials, and it is proposed to try them out under Queensland conditions. Seed can also be freed from infection by heat treatment.

In addition to taking precautions with the seed the cotton-grower should avoid the presence of infective debris from previous crops. To this end all cotton crops sould be thoroughly destroyed as early as possible after harvesting the crop. The plants should be cut, gathered, and burnt, and the remaining fragments dealt with by early and thorough ploughing followed by good cultivation. The practices which result in the preparation of a good seed-bed will ensure the intimate mixing of the debris with moist soil. Under these circumstances the bacteria do not survive long, whereas when slowly dried in the tissues they secrete a protecting coat of slime and withstand dessication over long periods.

The possibility of infection from adjoining diseased crops must not be forgotten, but if such crops are present little can be done to avoid spread to a clean crop. The growing of a break consisting of some tall crop will help to impede the spread of the disease.

Chloris Grasses in Queensland.

By S. L. EVERIST, Assistant to Botanist.

PART II.

THE next two species to be considered are *Chloris truncata* and *Chloris ventricosa.* From the two previously described they are easily distinguished by the shape of the spikelets. The drawings of the spikelets will illustrate this better than a description. It will be noticed that in these two species the organ labelled "sterile floret" is truncate, or sharply cut off at the top. This is characteristic of both the species here described, and serves to distinguish them from those treated previously. In *Chloris ventricosa* the sterile floret is almost enclosed by the lemma or "husk" of the fertile floret, whereas in *Chloris truncata* this is not so. The lemma of the fertile floret differs in shape in the two species, and this point also is illustrated in the drawings. Both these drawings are upon the same scale, and a comparison can thus be drawn between the size of the spikelets.

CHLORIS TRUNCATA.

(Plate 5.)

Botanical Name.—truncata, from Latin *truncatus*—shortened, referring to the cut-off appearance of the florets.

Botanical Description.—Stoloniferous perennial, stolons usually short and branched. Shoots flattened. Leaves distichous, lower internodes very short, leaf sheaths much exceeding them. Leaf sheaths strongly keeled and much flattened, with broad scarious margins, glabrous, striate; keel scabrous. Ligule small, reduced to a ciliate rim; auricles small and inconspicuous; collar thick, fairly wide, glabrous. Leaf blades usually short, rarely up to 25 cm. long, folded in the bud, folded or flat when mature, strongly keeled, the keel and edges of blades scaberulous; both surfaces glabrous and usually somewhat scabrous; sometimes the upper surface with short hairs near the base. Blades linear, slightly contracted at the base, apex rather obtuse, sometimes shortly ciliate. Leaves of flowering culms closely resembling those of the vegetative shoots except for the longer, less sharply keeled sheaths and the relatively shorter blade. Flowering culms short, erect, terete, bearing 5-10 long, slender, divaricate spikes. In one form the spikes are shorter, stouter, and less widely diverging. Rhachis of the spikes triquetrous, straight, becoming slender towards the tip; scaberulous for most of its length. Spikelets scattered in the lower part, imbricate for the greater length of the spikes. Spikelets sessile or very shortly pedicelled, pedicels, if present, very slender and scabrous. The two florets, which fall entire, are cuneate in profile and sharply truncate at the apex. They are indurated and very often black at maturity. Lower glume 1-nerved, membranous, narrow ovate lanceolate, acuminate, 1-2 mm. long. Upper glume 1-nerved, membranous, linear-lanceolate, acuminate, 2-3·5 mm. long. Lower lemma 3-nerved, the lateral nerves very close to the margin; obovate in outline, narrowly oblong or elliptic in profile, folded and keeled with a shallow longitudinal groove on each face; keel and faces somewhat scabrous. Lower edge of the lemma inrolled, but not enclosing the rhachilla; upper edge not inrolled and bearing a fringe of short hairs. Lemma 2·5-3 mm. long, including the base of the rhachilla, which bears a fringe of white hairs.

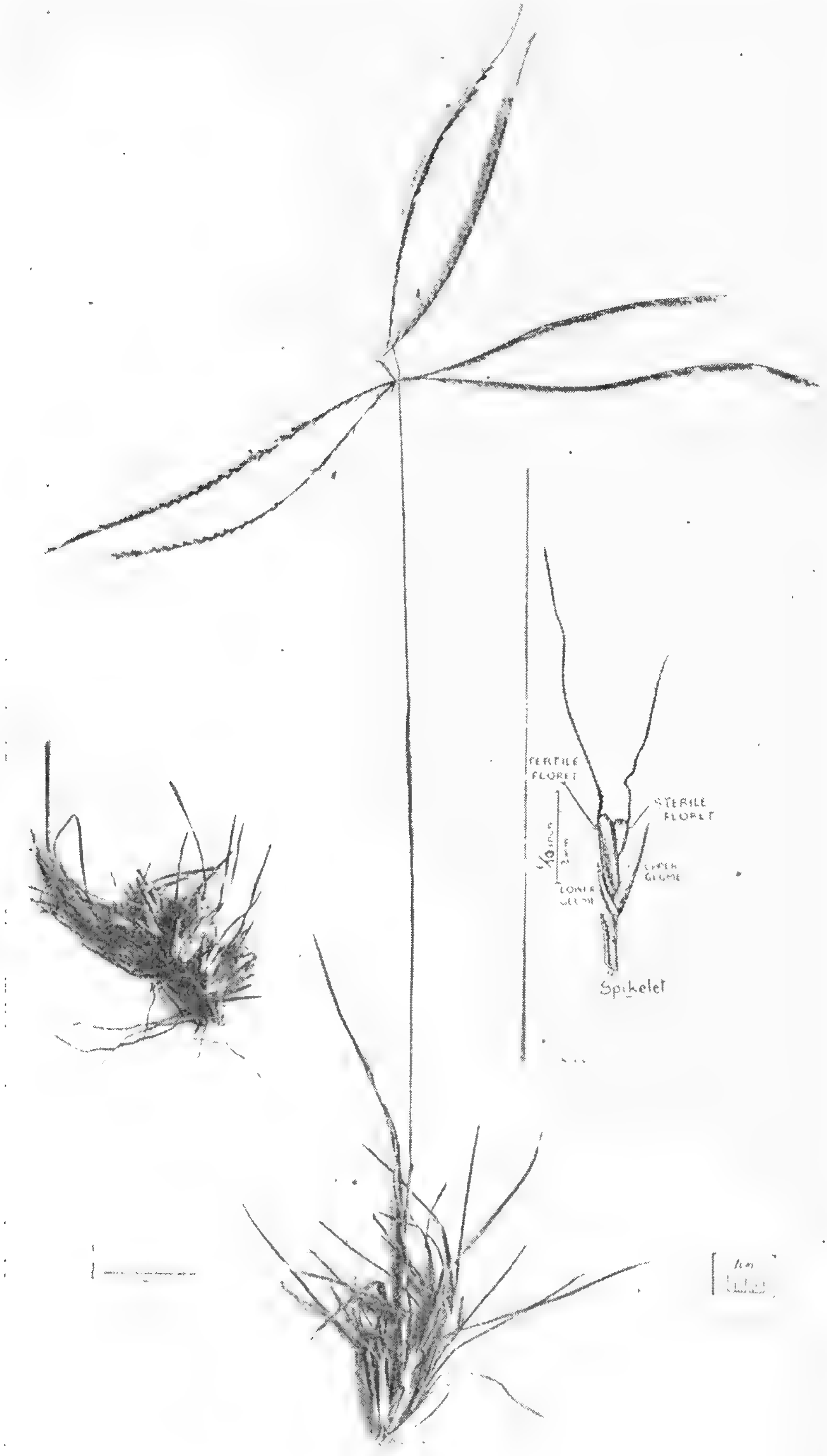


PLATE 5.—CHLORIS TRUNCATA.

Lemma awned from the shallow cleft between two short, obtuse, or truncate lobes. Awn slender, scaberulous, 5-15 mm. long. Palea of fertile floret membranous, obovate, 2-keeled, almost as long as the lemma. Lodicules 2, glabrous, cuneate. Stamens 3. Stigmas 2, short, laterally exserted. Caryopsis triquetrous, linear or narrowly elliptic, smooth and shining, pale brown, up to 2 mm. long. Embryo nearly one-half the length of the caryopsis. Rhachilla between the florets smooth, terete. Upper floret usually consisting of an empty lemma only; lemma 3-nerved, 1-2 mm. long, broadly cuneate in outline, narrowly cuneate in profile, folded but not keeled, truncate at the apex, emarginate, the edges slightly inrolled. Awn slender, scaberulous, up to 10 mm. long.

We have one specimen from Guyra, New South Wales, which bears a number of spikelets with two fertile florets and an empty lemma above them. In this the lemma of the second floret is the same in shape as that of a normal spikelet, and the palea, andrœcium and gynœcium are similar to those of the lower floret. The third floret bears a very short awn.

Popular Description.—A small, creeping grass forming a dense mat when eaten down by stock. Leaves pale green, short, fine and close together, conspicuously flattened, without hairs, but somewhat rough to the touch. Seed stalks upright, about 1 foot high, bearing at the top a number of long spreading spikes. Upon these spikes are two rows of small spikelets, or "seeds," which usually turn black when ripe. These are wedge shaped, and appear to be sharply cut off at the top. They bear two long fine awns or bristles.

Distribution.—In Queensland *Chloris truncata* has a rather limited distribution. So far as is known at present, it is confined to the Darling Downs and Maranoa districts. In these districts, however, it is abundant over fairly large areas, particularly in the Southern Maranoa.

Habitat.—*Chloris truncata* seems to favour black soil open downs, the edge of red soil country, and the edges of brigalow and belah country. It is not found on sandy soils or the heaviest black soils, such as coolibah flats.

Fodder Value, &c.—In its fodder value and response to stocking *Chloris truncata* closely resembles *Chloris divaricata,* to which it bears a marked similiarity in general appearance. When heavily grazed it spreads along the ground, forming a turf-like sward. Stock are reported as being fond of it, and it has the reputation of being a palatable, nutritious grass.

Reference.—*Chloris truncata* R. Br. Prodr. i, 186 (1810).

CHLORIS VENTRICOSA.

(Plate 6.)

Botanical Name.—*ventricosa,* from Latin *venter*—the belly or paunch, referring to the inflated appearance of the fertile floret.

Botanical Description.—Stoloniferous perennial, stolons branched and rooting at the nodes. Shoots flattened. Lower leaves distichous, internodes much shorter than the leaf sheaths. Leaf sheaths strongly keeled and much flattened, pale green, with broad scarious margins. In two of the forms the leaf sheaths are hairy when young, but usually become glabrous when old, or sometimes they are completely glabrous and scabrous. The other form has much larger glabrous sheaths, which are usually straw

coloured or pale green. Ligule small, membraneous, margin divided into minute cilia. Auricles usually consisting of a thick rim bearing upon its edge a thin, membranous projection, which is a prolongation of the broad, membranous margin of the leaf sheath. In the younger leaves there is usually a tuft of hairs upon the rim of the auricle, though these often disappear as the leaves grow older. Sometimes the hyaline projection of the auricles becomes broken off and only the thickened rim is left. Collar thick, smooth, glabrous. Lower leaf blades usually short and conspicuously flattened, frequently hairy when young, but often becoming glabrous when older. Base of the leaf blade above the ligule often contracted and the edges thickened. In one form the leaves are much longer and broader, and are quite glabrous. The culms are stouter and the plant is much more robust. Spikes 3-9, usually digitate from the apex of the flowering culm, but sometimes 2 or 3 produced from a prolongation of the central axis. Apex of flowering culms and base of spikes thickly set with short white hairs. Rhachis of spikes scabrous, slender, and flexuous. Spikelets usually closely imbricate, sessile. Lower glume 1-nerved, scarious, ovate-lanceolate, acuminate, 1-2·1 mm. long. Upper glume 1-nerved, scarious, linear, linear-lanceolate, or ovate-lanceolate, acute or shortly acuminate, 2·5-4·1 mm. long, usually 3-3·5 mm. Lower lemma 3-nerved, the lateral nerves close to the margin, broadly elliptic or slightly obovate in outline, irregularly elliptic or subrhomboidal in profile, folded and bluntly keeled, keel scabrous, each face of the lemma with a shallow oblique groove; lemma somewhat inflated and embracing the sterile floret, apex emarginate, awned from the cleft, lobes short, obtuse, scabrous or shortly ciliolate. Lower lemma, including the base of the rhachilla, varying in length from 2·4 to 4·8 mm. Awn short and slender, flexuous, scaberulous, 2-10·5 mm. long. Palea membranous, obovate, 2-keeled, keels ciliate. Lodicules 2, small, glabrous, cuneate. Stamens 3. Ovary glabrous, stigmas 2, short, laterally exserted. Caryopsis triquetrous, linear or narrowly elliptic, pale brown and shining, up to 2·2 mm. long, embryo large, nearly half as long as the caryopsis. Rhachilla above the fertile floret smooth, terete, and tough. Sterile lemma 3-nerved or 5-nerved in the upper half by division of the lateral nerves, broadly cuneate in outline, cuneate in profile, and almost enclosed by the fertile lemma, apex truncate and emarginate; surface smooth or scaberulous; 1·3-2·5 mm. long, usually about 2 mm., awned from the cleft of the apex; awn short and slender, scaberulous, 0·8-5·5 mm. long.

Three forms of this grass are met with in Queensland, but as a careful examination of the material in the Queensland Herbarium has revealed a number of intermediates between them, I do not feel justified in separating them. The first one, which was named by Bentham *Chloris ventricosa* var. *tenuis*, is a small, slender plant with spikelets generally about 3 mm. long. The leaves are much the same as those of the second, which Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, has identified with the plant named by Lindley *Chloris sclerantha*. This generally has the spikelets somewhat larger, 3·5-4 mm., and the plants are stouter. The third one has stout leaves and culms, and is a more robust grass. It grows up to a height of 3 ft. or more, and has longer, stouter spikes. The leaves also seem quite glabrous, whereas those of the other two forms are often hairy, particularly when young. The spikelets are larger and the awns generally relatively shorter, being scarcely longer than the fertile lemma. The fertile lemma varies in length from about 4 to 4·8 mm.

PLATE 6.—CHLORIS VENTRICOSA.

As will be seen, the chief distinction is the size of the spikelets. A very large number of measurements has revealed that variations of more than 1 mm. may occur in spikelets from the same plant, and that the size of the spikelets is not at all constant, considerable overlapping occurring in the size of the spikelets from the different forms. In view of this, it does not seem advisable in the present state of our knowledge to separate the forms under distinct names.

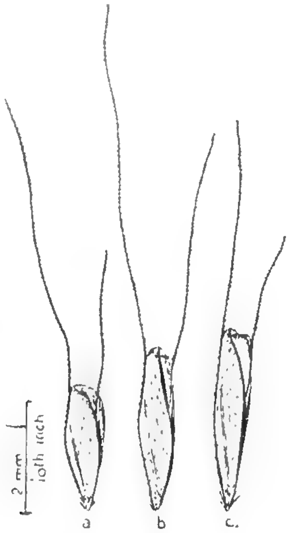


PLATE 7.

The three spikelets shown in Plate 7 illustrate typical examples of the three forms. The plant illustrated in Plate 6 is the second form (*C. sclerantha* Lindl.).

Popular Description.—Perennial grass, rather more robust than *C. truncata*, creeping slightly and forming rather large clumps under good conditions. Leaves in two of the forms short, slender, conspicuously flattened, and usually slightly hairy, though they lose their hairs as they grow older. The third form is larger and more robust, and grows up to 3 ft. or more high. The leaves are larger and coarser. Seed stalks upright, giving off at the top 3-9, usually 5 or 6, flexuous spikes, upon which are borne numerous spikelets or "seeds" in two close, even rows. Each spikelet bears two short, slender awns or bristles.

Distribution.—*Chloris ventricosa* is more widespread in Queensland than *C. truncata*. The small form is found over most of the Moreton district, and in parts of the Darling Downs and Burnett districts. The other two do not seem to approach so near the coast, and are confined to the Western and Central districts. We have specimens from the Darling Downs, Maranoa, Burnett, Port Curtis, Leichhardt, and Mitchell districts.

Habitat.—The various forms of *Chloris ventricosa* mostly favour fairly good soils, though they are found growing in a variety of situations. They are not partial to very light sandy soils, but do well upon the heavier and richer soils of the interior.

Fodder Value, &c.—Like its allies, *Chloris ventricosa* is an excellent feed for stock, particularly sheep. It has the same power of running out and forming a sward, and is a grass worthy of encouragement.

Reference.—*Chloris ventricosa*, R. Br., Prodr. i, 186 (1810). *C. sclerantha* Lindl., in Mitch. Trop. Austr. 31 (1848).

[TO BE CONTINUED.]

Sterility in Dairy Cows.

OVARIAN DISEASES.

By K. S. McINTOSH, H.D.A., B.V.Sc., Animal Health Station, Yeerongpilly.

[*Continued from p. 336, Part III. (September), Vol. XLII.*, 1934.]

THE ovaries as we have observed are two small solid organs, one on each side, about the size of small almond nuts. It is these organs which manufacture the ova, eggs, or female germ cells.

Apart from this function they also secrete certain substances which are discharged into the blood stream and act as chemical messengers in the body. These chemical messengers regulate periods of sexual heat, the muscular impulses which discharge the young calf from the uterus, and the subsequent secretion of milk.

Thus disease of the ovary may not only cause sterility by the failure to produce ova, but also by upsetting the normal regular cycle of sexual heat, &c.

The cause of ovarian disease is not completely understood, but three distinct abnormal conditions are recognised:—

(1) Cystic ovary.

(2) Retained "yellow body."

(3) Fibrosis.

Cystic Ovary.

"Cystic ovary" means the formation of a fibrous walled cyst on one or both ovaries the size of which may be from a pea to an orange. When present, cysts cause frequent and irregular periods of heat without any resulting conception when the cow is served by the bull.

Retained "Yellow Body."

When the ovary discharges the ovum, the latter is replaced by a yellow body in the ovary. If the cow becomes pregnant the yellow body remains intact until the cow has calved when it disappears. If it persists after calving the result is irregular and infrequent periods of heat in most cases with failure to conceive when served by the bull.

To diagnose either of the above conditions it is necessary to feel the ovary with the hand. First cut the finger nails short, grease the hand and arm, and introduce into the rectum or back passage. Do not attempt to feel them through the vagina as it is impossible to do so and considerable injury to the cow will result. Unless the rectum is empty it must be emptied by hand and then placing the palm downwards gently feel the vagina, the neck of the uterus, the body of the uterus, and then the ovaries. The last named lie a little below and on either side of the rectum and move about freely on their loose attachments. Now gently but firmly capture the ovary in the fingers and roll it about feeling carefully for any rounded projections from its surface. If one (or more) of these is felt, endeavour to squeeze it out by pressure with the thumb. If it will squeeze out with reasonable pressure, it is probably a case of retained yellow body, but it is practically impossible to remove ovarian cysts in this manner. If the yellow body is pressed out the cow should again be served at the next period of heat. It must be

remembered, however, that the examination, &c., is being performed through the wall of the rectum and that violent or undue pressure must not be exerted. The operator should also guard against pinching the wall of the bowel or digging it with the finger nails.

As a general rule yellow bodies may be squeezed out leaving quite a small concavity on the ovary, but this is impossible with the cysts for which no home treatment can be recommended. Thus if a cyst is found it would pay to spey the cow, milk her till dry, then sell her to the butcher.

Fibrosis of the Ovaries.

This means that the fibrous tissue which normally forms the framework which holds the ovarian tissue proper has replaced the ovarian tissue and squeezed it out of existence. The result is that the animal may not come on heat at all, and as she cannot manufacture ova or germ cells she is barren. This condition is sometimes met with in old cows or cows which have chronic inflammation of the ovaries. When felt between the fingers the ovary is small and hard. Speying is the only satisfactory method of dealing with fibrosis of the ovaries.

The cause of ovarian troubles is obscure. In many cases they appear to be associated with contagious abortion.

DISEASES OF THE FALLOPIAN TUBES.

The function of the Fallopian tubes is to carry the ova from the ovary to the uterus, thus anything which causes an obstruction of these tubes causes sterility. The commonest cause of obstruction is inflammation, which is in practically all cases an extension from infection of the uterus. The condition is extremely difficult to diagnose and treatment is impossible. Still it is important to know that such may exist and that prevention lies in keeping the uterus healthy.

DISEASES OF THE UTERUS.

The most serious disease of the uterus with which the farmer has to contend is contagious abortion. It is unnecessary to stress the economic importance of this disease to dairy farmers. Suffice to note that it is perhaps the most serious disease with which the dairy farmer is confronted.

The cause is a germ known as the *Bacillus abortus* which lives and grows on the body of the diseased animal and is voided in the afterbirth and discharges from the uterus and also in the milk. It can live and remain infective for some time in these discharges outside the animal body. Thus the disease is contagious—that is, it spreads from one animal to another.

How the Disease is Spread.

The disease is introduced into the herd by the introduction of an infected cow. Three methods of infection are recognised:—

(1) By eating material contaminated with discharges from a diseased cow. This material may consist of grass and pasture plants or perhaps the afterbirth or discharges.

(2) By direct mechanical transmission by the bull. Bulls themselves are sometimes affected with the disease when it may cause inflammation of the testicles or perhaps no visible change in the genital organs. The bull should, however, be regarded as a potential carrier of the disease.

(3) By infection via the teat canal during milking or by contact of the external opening of the teat with contaminated pastures.

The germ of contagious abortion in the animal body is situated in the uterus when the cow is pregnant and for some weeks afterwards, and in the udder whilst the cow is milking.

A common method of introducing the disease into the herd is by using a neighbour's bull or allowing a neighbour to bring his cows to the bull for service.

From the above it will be seen that contagious abortion is not a sporadic disease, but is introduced into the herd by an animal already infected.

When calves are born they are heavily contaminated with the abortion germ but soon lose the infection, it being held that the germ can only live in the sexually mature animal.

Symptoms.

In a typical case of the disease the first symptom noticed is abortion. This is frequently attended by retention of afterbirth. Following the first abortion one of three things may happen:—

(1) The cow may again become pregnant and later abort, doing this several times until she finally becomes sterile or bears full-time calves.
(2) She may revert to normal.
(3) She may become sterile.

Once an animal has contracted the disease she may show the above symptoms, or may appear healthy throughout. Investigations have shown, however, that once a cow is affected she remains a carrier for the rest of her life and thus a danger to clean animals.

Diagnosis.

If one or more cows on a farm abort for no apparent reason then contagious abortion should be suspected, particularly if the trouble is followed by sterility in some cases. It is impossible, however, to diagnose the case with any degree of certainty without a blood test carried out in the laboratory.

If the disease is suspected blood should be taken and forwarded in accordance with the following instructions:—

After clipping away the hair with a pair of scissors, cut with a sharp knife across a large vein on the top outside of the ear, and allow the blood to flow direct into a *scrupulously clean and perfectly dry bottle*. Half a fluid ounce (one tablespoonful) of blood is required, in an ounce bottle. The sample must not be shaken up, but left to stand undisturbed for an hour or two in order to form a firm clot. Then pack, address, and despatch the sample so as to reach the Animal Health Station, Yeerongpilly, with as little delay as possible. Decomposed samples of blood are of no use for the test. If the bottles containing blood are placed on ice or in a cool chamber before being despatched they carry very well.

Parcels should be labelled with the sender's name and address to enable easy identification. The test is carried out free of charge, but we cannot supply bottles.

Elimination and Control.

No satisfactory method of treatment of affected animals has yet been evolved, and the eradication and control of the disease in a herd present very serious difficulties. The simplest and only effective method of dealing with the disease is by eradication.

Firstly, samples of blood from every individual in the herd (including bulls) are submitted to the agglutination test. After the test all positive reactors must be immediately removed from the holding. A second test should follow two months later and again all reactors removed, and so on until two clean tests are obtained.

Practically all of the diseased cattle will be eliminated on the first test but some will not, hence the necessity for subsequent tests.

Should it be discovered that a large percentage of a herd is affected, the course to be pursued then depends upon the financial position of the owner. If he can afford to adopt the eradication method all well and good, but in many cases the sale of such a large portion of the herd would mean disaster. Thus a modification of the above is adopted in many cases in other States. This is known as the two-farm method. This means the division of the farm into two distinct and separate farms divided by a double or buffer fence. On one farm are kept the abortion-free animals and on the other the reactors. If the scheme can be carried out thoroughly it is sound and means the gradual eradication of the disease from both farms. On weaning, the calves must be run in a clean paddock until of breeding age, and then introduced into the clean herd. On no account must they be fed on milk from the abortion herd nor must they be allowed contact with them or the clean cows. Poddies and older calves must, of course, be run separately.

The third method is unsatisfactory, but unfortunately is one which some farmers would be forced to adopt on account of the financial difficulties presented by either the eradication or two-farm method.

This consists of attending to cattle subsequent to aborting or calving in an endeavour to prevent their becoming sterile. No attempt is made to eradicate or control the disease, but an endeavour is made to minimise losses by preserving the fertility of the cows. In time, despite all treatment, some of the cows will fail to breed and these should be speyed, fattened, and sold to the butcher.

Eventually practically all of the animals in the herd will become affected and remain carriers. Abortions become fewer as the cattle pass the aborting stage, and most of the trouble is encountered with young stock which have not yet acquired their tolerance to the disease. Losses through abortion and sterility, though not as a rule drastic, will continue indefinitely, and it is for the stockowner to decide whether he can stand the first loss and avoid future trouble or whether he prefers a small but continuous drain on his profits.

General.

It is interesting to note that recent work has shown that the *Bacillus abortus* may be much more important than was previously imagined. For many years it has been recognised that this and another similar germ affecting goats is the cause of undulant fever in man. Not many cases of this disease in man have been recorded in Australia. It does not cause abortion in humans.

Pure cultures of *Bacillus abortus* have been isolated from unopened cases of fistulous withers in horses, and until further work is done we must regard any horse affected with fistulous withers as a probable carrier of the disease.

The germ has also been found pure in large waterly swellings (hygromata) in the vicinity of joints of cattle.

Pigs also become affected with the abortion germ which causes a disease similar to that seen in cattle. Field observations so far have not shown abortion in pigs to be of very great importance except in isolated outbreaks.

Fowls are mechanical carriers of the disease, the germs passing through their digestive system, and as fowls are omnivorous birds they may easily feed on afterbirth and later from the feed bin; hence their danger as mechanical carriers.

Warning.

In spite of the tremendous amount of scientific work which has been done in this and other countries no cure has yet been evolved for the treatment of contagious abortion. The employment of so-called preventive and curative treatments by drugs, chemicals, vaccines, &c., only results in waste of time and money, and disappointment to the farmer.

Sporadic or Accidental Abortion.

Various factors such as mechanical injuries, acute general disease, certain drugs, drastic purgatives, certain weeds, &c., may at times cause abortion in individual animals, but if this occurs the cause is usually fairly obvious. If any uncertainty exists it would be as well to forward a specimen of blood for test for contagious abortion.

Retained Afterbirth and Metritis.

Metritis simply means inflammation of the uterus or womb and is usually the result of abortion or infection subsequent to calving. The commonest cause of this infection is retained afterbirth.

The afterbirth consists of various membranes which surround the calf before it is born and it is through them that it gains its nourishment and gets rid of its waste products. The membranes are attached to the calf at the navel and to the uterus of the mother by means of a number of so-called "buttons" or cotyledons. These "buttons" consist of tufts of tiny finger-like processes which interlock with similar processes on the uterine "buttons." When the cow calves the contraction of the muscular walls of the uterus not only expel the calf but also squeeze the finger-like processes of the membranes away from their corresponding processes on the uterus and thus allow the expulsion of the afterbirth.

Sometimes through lack of muscular tone of the uterus and often in the case of abortion the separation of the opposing pairs of "buttons" does not take place and the afterbirth is retained. Normally, it is expelled within twenty-four hours after calving, and if this does not happen the cow has to be assisted in removing it. Flushing of the uterus with warm weak Condy's crystals solution together with gentle but steady traction will sometimes bring it away. In many cases, however, it is necessary to remove the membranes with the hands.

Firstly, the finger-nails should be cut short and the hands scrubbed thoroughly clean. Next wash the external opening and hind parts of the cow. Lubricate the arm and hand with carbolic oil and insert the hand into the uterus.

The "buttons" will be readily felt and an attempt should be made to separate as many as possible from their corresponding "buttons" on the wall of the uterus. If the free end of the membrane is pulled gently from time to time this will assist the work. When the operation is complete, flush out the uterus with large quantities of weak Condy's crystals solution by means of a funnel and a piece of rubber tubing.

The cow should be given greenstuff to keep her bowels open, also a dose of from 10 oz. to 1 lb. of Epsom salts, 1 oz. of ground ginger in a pint of water. If the weather is cold rug her or place her in a shed. Flushing out should be continued as long as there is any discharge present.

DISEASES OF THE VAGINA.

The only disease under this heading is vaginitis. It is probably responsible for more cases of sterility than any other one complaint. Probably the cause is a filterable virus, i.e., a germ too small to be seen by means of the microscope, yet demonstrable by the fact that infective material will transmit the disease. It is very widespread throughout the dairying districts of Australia, is very contagious, and the means by which it is transmitted are only partly understood. It is certainly spread from cow to cow by the bull, but as poddy calves also become affected other agencies, probably dust and flies, are also involved. Three forms are recognised, namely:—

Contagious granular vaginitis.

Congestive vaginitis.

Purulent vaginitis.

The firstnamed is by far the commonest form. It is characterised by the formation of numerous small shot-like or blister-like elevations on the lining membrane of the vagina accompanied by a certain amount of reddening. Congestive vaginitis appears as a streaky inflammation of the membrane of the vagina.

Purulent vaginitis causes a slight discharge of pus from the vagina which often sticks the hairs together at the tip of the vulva. The treatment is as follows:—

Procure a 1-pint brass syringe and a number of lengths of rubber tubing.

Dissolve 12 oz. of zinc sulphate in 1 quart of water. This makes a stock solution. Add 1 oz. of stock solution to 1 gallon of water to make the solution for treatment. Each cow should be douched with 1 pint of the solution. As each cow is finished, disconnect the rubber tubing from the syringe, drop it into boiling water, and fit a fresh piece. The tubing may be used again after immersion in boiling water. Treat all cows for three weeks on every alternate day irrespective of pregnancy or whether they appear to have the disease. Then treat each cow in a like manner after calving. This method means extra work and time but is the most effective treatment known.

Frequently the sheath and penis of the bull become infected from cows suffering from vaginitis. He should receive the same routine

treatment as the cows and in addition the sheath should be syringed before and after service with a weak solution of Condy's crystals.

To accomplish this it is necessary to run the bull in a separate paddock and take the cows to him for service. This is not only desirable from a disease control standpoint but for many and obvious reasons.

OTHER CAUSES OF STERILITY.

Sterility may be the result of any of the following:—Growths in the genital apparatus, tuberculosis of the genital organs, overfat or poor condition, hereditary deformities, mineral deficiency, mechanical injuries, and overworking of bulls.

Of these, tuberculosis and mineral deficiency. It is impossible to deal with these subjects in an article of this nature, but it is hoped that they will be dealt with in the pages of this Journal in the near future.

Summary.

The two outstanding causes of sterility in dairy herds are vaginitis and contagious abortion. Losses due to sterility are in many cases preventable.

It is a practical and payable proposition for a farmer to make every endeavour on the above lines to reduce his losses from this cause to an absolute minimum.

EXPIRED SUBSCRIPTIONS.

A very large number of subscriptions to the Journal expired in May and June, and have not been renewed. A further large number expires with this issue.

Subscribers whose term expired in May and June have been continued on our mailing list, and a yellow wrapper on this month's Journal (July) is an indication that their subscriptions are now due.

Subscribers whose term expires with this issue are reminded similarly.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Clean Crops and their Value to the Farmer.

By A. E. GIBSON, Director of Agriculture.

A CLEAN home amid pleasant surroundings is the pride and joy of the housewife who takes any interest in her own and her family's welfare. Similarly, clean crops and cultivation areas should be the pride and ambition of the farmer who is seriously engaged in farming operations for the maximum return which he can obtain for his labours. When it is considered that it is both expensive to cultivate paddocks for a return of grain or fodder which includes foreign growth to the detriment of the value of primary products, the question naturally arises why is the primary producer so careless of his own particular welfare. Clean seed sown on clean cultivation areas under normal conditions gives the highest monetary return for the trouble and expense of producing a crop, in fact the maximum is obtained by so doing, but where cultivation areas are nothing more or less than propagating fields for the growth of weeds and foreign growths generally, the results are both discouraging and productive of monetary loss. Some few months ago some attention was drawn to this phase of farming operations on the Downs through the medium of the press, and although it was expected that the wrath of the farming community generally would be evidenced in a series of replies through the same source, much surprise and gratification was felt at the receipt of some complimentary remarks from practical farmers, who stated that advice on these lines was welcomed by them and asked for more.

In the preparation of his fallowed areas the average farmer gives little consideration to the fact that the eradication of weeds and foreign growths from such areas is a costly business, meaning generally increased wear and tear on machinery, additional costs where fuel and oil are concerned if tractors are used, and the expenditure of much energy on the part of horse teams where such are utilised. The remedy appears to lie in tackling the problem from another angle, and although this may entail some initial expense in the way of making fences sheep-proof, the ultimate result will well repay the additional cost of labour and material involved. In passing through the Darling Downs either by car or rail the Southern farmer is not impressed by the state of the boundary fences, and although it is difficult in the heavy basaltic soils of this State to keep fences in good order, lack of attention, in many cases, is chiefly the cause of their condition. Fencing posts, if originally split from sound material, last for many years, and it is maintained that if most of the fences were reconditioned, utilising two or three droppers of sawn hardwood as substitutes for posts, the item of expense where posts are concerned could be considerably lessened. The addition of wire netting of suitable gauge and height both strengthens and sustains such a type of fence and at once converts the property into one which is capable of keeping sheep within bounds. The conversion of weeds and foreign growth into wool and mutton is a much cheaper proposition than their eradication by means of implements and the expenditure of personal energy. Additionally, the value of sheep manure is a factor which is overlooked. Whilst their value as a means of checking rank growths of winter cereals is universally acknowledged, this system is

not adopted to the extent to which it might be. Wheatgrowers are well aware that nothing stimulates the growth of a crop or has the same tillering effect as when fed off by sheep. Cattle have not the same value and greater damage accrues to the cultivation.

Headlands, those prolific sources of weeds, are kept in order and the resultant crops, provided that clean and graded seed is utilised for sowing operations, are improved at no extra cost. During last wheat season the prevalence of oats in the wheat crops made it difficult to pronounce whether the original crop was oats or wheat, so badly infested were the paddocks. A continuance of this class of farming must result in loss to the grower by reason of the dockages imposed. I have in mind two particular paddocks, each of considerable area, one of which had had sheep agisted thereon, whilst the other had been allowed uninterrupted growth—apart from cultivating operations; the result was worthy of notice. An almost total absence of oats was noticeable in the one instance, whilst the other was a 50-50 admixture of oats and wheat, which harvesting operations would only intensify.

Canary seed, which comes under the control of the Canary Seed Pool, is another primary product which is productive of much trouble and annoyance to the Board, and ultimately to the individual grower. It is the rare exception to find a consignment of canary seed which has been harvested from clean paddocks, and the amount of freight which is paid by the Board for the transport of weed seeds and rubbish from the growers' stations to Brisbane where it is cleaned, would, if such consignments were clean, mean an additonal advance to growers. Commodity Boards which handle grain are invariably blamed for the cost of operations, but farmers are apt to overlook the fact that they are contributing factors themselves by reason of their lack of approved farming methods. To say that it is impossible to keep a paddock clear of weeds is but a poor compliment to their own efficiency. It is admitted that certain growths are difficult to control, but where such are present the spirit of *Lassez faire* is only too evident, with the result that truth prevails in the statement that one year's seeding means nine years weeding, and paddocks ultimately become useless for the profitable production of grain. Fields which are so badly infested with mixed growths of grain can to a certain extent be handled by cutting the crop for hay purposes, care being taken to see that the grain is sufficiently immature at the time of cutting to ensure that no subsequent propagation at least from that crop will eventuate—better still if the crop is utilised for silage—but in both cases it is only an economic proposition to handle a relatively small area. Wild oats will, as is well known, lie dormant in the soil for years and will only germinate when conditions of soil moisture, temperature, and tilth are favourable for their germination. As oats, and particularly wild oats, put in an early appearance on the fallows sheep are the most efficient and economical controllers of such growth. Occasionally vegetable growths put in an appearance which cannot be dealt with by stock, and where such occurs it is a matter of urgency that these be eradicated at once—if necessary by poisoning. Wild Chickory (sometimes termed Lignum) is perhaps one of the most troublesome in this regard, as its admixture with a crop practically renders harvesting impossible.

Growers of lucerne for marketing direct know the value of clean lucerne paddocks free from the inclusion of grass, particularly where this legume is marketed in the form of hay, as nothing deteriorates the

value of lucerne hay, even if perfectly cured and baled, more than the inclusion of grass. Quotations which appear in the daily press are to the effect that prime leafy well-baled hay will fetch top price and the inevitable grassy lines 2s. 6d. to 3s. lower.

Remember that the item of freight amounts to exactly the same amount per ton on produce produced under indifferent conditions as that on prime produce—wherein, then, is the sense of paying a tax on production in freighting rubbish, weed seeds, &c., to the marketing centres to buyers who are looking for the best, but if forced to do so will purchase a lower quality article at a considerably reduced value—entirely to the detriment of the careless producer.

In connection with advice dealing with clean crops, it is necessary that some mention should be made of the Pure Seed Act, which, as farmers are probably aware, was brought in for their protection, and if they neglect to use the facilities which are made available for them, then they themselves only are to blame.

The purchase of inferior seed is in the end the most costly investment, and one which in this period of low prices for primary commodities cannot be economically entertained. Similarly the control of smut, bunt, and other fungoid diseases is the function of this Department, and advice on such matters is always obtainable. I mention this simply for the purpose of reminding farmers that the assistance of the Department of Agriculture is at all times tendered to the farmers on matters pertaining to their welfare.

QUEENSLAND SHOW DATES, 1935.

July.

Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Kilcoy, 11 and 12.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Nambour Show, 18, 19; Campdraft, 20.
Cairns, 23, 24, 25.
Atherton, 30 and 31.
Gatton, 31 July and 1 August.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.
Home Hill, 30 and 31.

September.

Brisbane River Carnival and Campdraft, Esk, 6 and 7.
Imbil, 6 and 7.
Pomona, 13 and 14.
Tully, 13 and 14.
Rocklea, 14.
Beenleigh, 20 and 21.
Innisfail, 20 and 21.
Kenilworth, 28.

October.

Malanda, 2 and 3.

Quality in Bright Tobacco and Home Grading.

N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

[*Continued from p.* 568, *Vol. XLIII.* (*June*, 1935).]

Home Grades.

IT is not to be supposed that leaf of the various sizes enumerated and all colours other than green will be found in any one crop, or that injury will be experienced in each of the percentages stated.

Sizes will usually be confined to three above 8 inches. Colours other than green to two, or, in odd instances, to three, and injury to little or much, according to prevalence or otherwise of disease, injurious insects, adverse seasonal conditions, and the grower's attention.

The following grades, according to the sizes defined, are suggested for growers' attention. In each case the grade will be qualified by one of the colours, as lemon, bright mahogany, mahogany, or dark, except in shorts and scrap. All leaf with a definite green cast should be reconditioned and bulked for a further period. In each of the numbered grades the body or thickness of each leaf, as well as colour, shade, and finish, should agree. Dusky or dark colour shades should not be confused with walnut or dark mahogany colour. In the latter the body of leaf is heaviest.

Grade 1 (L1, BM1, M1, or D1, according to colour and body).—Light-colour shade. Bright finish. Tolerance 5 per cent. injury or blemish.

Grade 2 (L2, BM2, M2, or D2, according to colour and body).—True colour shade. Bright to clear finish. Leaf with a greenish-yellow tinge may be included. Tolerance 10 per cent. injury or blemish.

Grade 3 (L3, BM3, M3, or D3, according to colour and body).—True colour shade. Clear to normal finish. Leaf with a yellowish-green tinge may be included. Tolerance 15 per cent. injury or blemish.

Grade 4 (L4, BM4, M4, or D4, according to colour and body).—Fairly true colour shade. Dull finish. Tolerance 20 per cent. injury or blemish.

Grade 5 (L5, BM5, M5, or D5, according to colour and body).—Dusky colour shade. Cloudy finish. Tolerance 40 per cent. injury.

Grade 6 (L6, BM6, M6, or D6, according to colour and body).—Dark colour shade. Dingy finish. Tolerance upward of 40 per cent. injury.

Bright Shorts (BS1).—Leaf 8 to 12 inches in length of insufficient quality to conform to grades 1 or 2 in lemon or bright mahogany. Tolerance 20 per cent. injury or blemish.

Bright Shorts (BS2).—Leaf 8 to 12 inches in length similar to BS1, but with greater injury.

Dark Shorts (DS1).—Leaf 8 to 12 inches in length of insufficient quality to conform to grades 1, 2, or 3 in mahogany or walnut. Tolerance 20 per cent. injury.

Dark Shorts (DS2).—Leaf 8 to 12 inches in length. Dark colour shade. Dingy finish. Showing upward of 20 per cent. injury.

Bright Scrap.—Leaf under 8 inches long and leaf very much broken, or pieces of leaf of a generally pale to true lemon or bright mahogany colour shade. Free from string, suckers, dirt, or other foreign matter. Is not tied into hands.

Dark Scrap.—Leaf under 8 inches long and leaf very much broken, or pieces of leaf of a generally dark colour, irrespective of body. Free from string, suckers, dirt, or other foreign matter. Is not tied into hands.

Green.—The grading of leaf with a definite green cast is not suggested. Should it, however, be found necessary to offer it for sale it may be graded according to the shade of greenness and extent of injury.

The grower will improve his knowledge of quality in flue-cured tobacco and his skill in classification of leaf by examining his grades to see if they respectively conform to the specifications of an American standard.

Hands.

After the leaf has been sorted into the different grades it is tied into hands, each containing from twelve to twenty leaves according to their size. It is not necessary to count the leaves to form a hand, but a sufficient number should be used to make the butt measure as near as possible 1 inch in diameter; if made too big the hands are less presentable and liable to become loose.

Medium-sized leaves of the same colour, made extra limp by steaming or other suitable means, are used to bind the hands. Each such leaf is folded so that the midrib will be on the inside and not show when the hand is tied. Grasping the bunch of leaves in the left hand, the butts are beaten or pressed down until they are level. The binder is then held with the tip pressed firmly against the stems about 1½ inch from the ends by the left thumb and wound tightly round with the edge about ⅛ inch above the butts until about 4 inches remains. The leaves of the hand are now evenly divided and the butt end of the binder pulled through to keep it from becoming unwound. A neater tie is made when the binder is made to cover the ends of the butts before being wound around, but this is not essential. The binder should not reach too far down the hand, a width of 1½ inches to not more than 2 inches with large leaf from the butt end being desirable.

Hands of even size neatly tied render the tobacco much more attractive and tend to influence a better offer. Packages should be neat and clean with growers name and other particulars neatly stencilled thereon. Particulars regarding packing will be found in "Tobacco Growing in Queensland."

In conclusion, the following facts are worthy of careful note:—The smoking quality of ripe leaf from each district is known to buyers who base their offers accordingly. There is little disparity in the highest prices recorded at auction or otherwise for best quality leaf of each Queensland-producing district. Ripeness is the prime essential, and is indicated by colour and leaf aroma. Values will be lessened by blemish, damage, and inferiority of texture, but to a greater degree by unripeness. It has been abundantly demonstrated that unripe leaf is not wanted. The grower is known by his product.

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GARDEN FURNITURE FROM ROUND TIMBER.

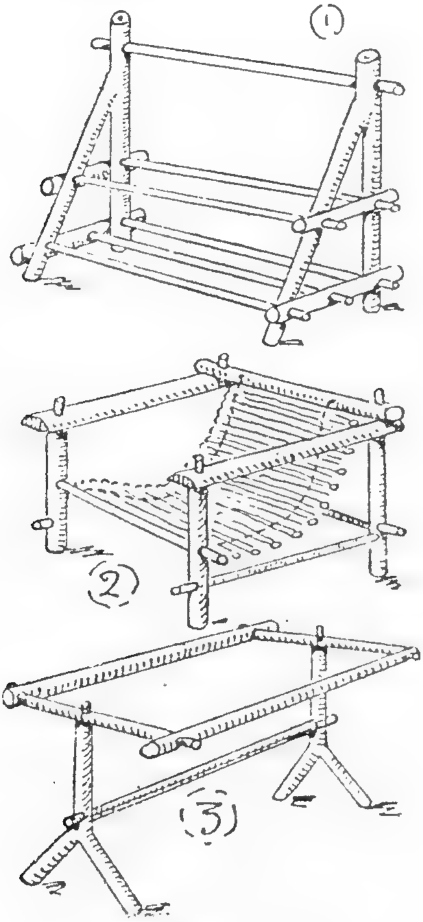

PLATE 8.

Taking advantage of natural forks and curves, No. 1 shows a plant stand using forks for the uprights boring right through for the cross-pieces.

No. 2 shows a lounge chair with round uprights to split slabs for the arms, dowelled together, the seat made of bush sticks threaded with wire, or weave the wire on two strands over and under, cut off the projecting round tenons or dowels when finished; they are left in the sketch to show method of working.

Sketch 3 is a table with forks for legs, cover with boards or round sticks close together if the rustic effect is required. The only tools required are a fairly fine-toothed saw, a brace and a couple of bits, a chisel or even a knife and a hammer. Leave the bark on if possible, or peel, stain, and varnish with a cheap varnish stain.

Tobacco Diseases.

SMOKING TESTS.

The Australian Agricultural Council received at its last meeting a report of the tobacco investigation work of the Commonwealth Bureau of Scientific and Industrial Research. The report follows:—

THE investigational work undertaken by the Commonwealth Bureau of Scientific and Industrial Research covers the following four phases:—(1) Disease studies; (2) chemical investigations; (3) curing experiments; (4) processing investigations and smoking tests.

Disease Studies.

(*a*) Of the disease studies those concerning Downy Mildew (Blue Mould) still occupy the most important place, as this disease has continued to take heavy toll of the crop during the last two years in marked contrast with the relatively disease-free crop of 1932.

Experiments have been concentrated mainly on seed-bed control because, although in late summer and autumn field mildew attracts much attention, especially in the later planted crops, it is the seedling supply which determines initially the potential crop. These experiments are briefly described in the succeeding five paragraphs.

(i.) Experiments in the use of copper emulsion, colloidal copper, and Bordeaux mixture sprays were carried on at Wangaratta, Victoria, and Deniliquin and Ashford, New South Wales. The sprays did not prevent infection, but they tended to check the spread of the disease. Bordeaux mixture was not as effective as the sprays recommended by the Queensland Department of Agriculture.

(ii.) At Ashford, in co-operation with the New South Wales Department of Agriculture, and at Wangaratta, the "Bathurst" type of seed-bed was used to ascertain whether healthy seedlings could be raised without the use of sprays, but during the past season they were not successful in preventing or controlling Downy Mildew.

(iii.) During late spring and summer experiments on a small scale were designed in Canberra to test the effects on the disease of the use of substances which would vaporise readily, such as petrol, toluol, benzol, &c. These were distinctly promising and accordingly, despite the fact that it was autumn, a larger scale trial was set up in Canberra and at Eurobin, Victoria. In the former place 14 cold frames were used, and at Eurobin, by courtesy of Panlook Bros., 17 seed-beds of the "Bathurst" type were made available. The experiments are still in progress and are available for inspection. In both places toluol and benzol were used, and at Canberra petrol additionally with adequate checks. Vapours were used only when beds were closed, i.e., at night and when days were wet, and during fine days they were wide open. All beds were inoculated heavily with viable conidia two or three times in addition to natural exposure to infection by day. The check beds are wiped out; the benzol-treated beds are free from disease, and the toluol-treated beds show a little disease.

The trials will be continued during the coming spring. At present we can say that the experiments have given extremely satisfactory results, especially with benzol, but much more work remains to be done.

Immune Varieties.

(iv.) Whatever control may be reached by the application of substances to plants it is costly as compared with the use of resistant or *immune* varieties. No varieties of commercial tobacco are resistant, but some are not so highly susceptible as others. The testing and crossing of some types is in progress, but it is felt that the chances of obtaining a truly resistant type, particularly from commercial varieties, are rather slender. One avenue should be explored, however, and that is the search in the native home of tobacco, viz., South and Central America, for types which, while not commercially valuable, might be resistant to the disease and, therefore, valuable in hybridising with some of our commercial lines to build up resistant strains.

(v.) Data are being accumulated with respect to the incidence of epidemic outbreaks and climate, host relationships, overwintering, &c. This year again the disease is occurring in the field wherever plants are still standing. *Nicotiana glauca,* a wild host, was found on 16th May to be heavily infected at Cobram, Victoria, which used to be a centre for the growing of seedlings.

(*b*) The other disease which has been under investigation is that which is known as Frogeye and which may be serious in Central and North Queensland in wet seasons. In a preliminary publication it was pointed out that the fungus causing the disease may be found associated with the seed, leaf scrap, the soil, and overwintering plants, and that it could be controlled by using clean seed in clean seed-bed soil and by spraying the seedlings. Experiments conducted at Mareeba showed that sprays recommended by the Queensland Department of Agriculture for Downy Mildew control are effective in seed-bed control of leafspot.

Chemical Investigations.

These are in progress at the University of Sydney and are designed to discover the causes of low quality in certain leaf and ultimately to devise methods whereby improvement in quality may be effected. Having been started not quite a year ago it follows that preliminary work only has been possible, but tests show that leaf of low quality tends to be low in carbohydrate, high in nitrogen, and to give smoke which is highly alkaline to litmus.

Chemical analyses of samples of natural or processed leaf are correlated with smoking tests. The following table illustrates relative values for certain samples:—

Sample Smoking Quality.	Good American.	Australian Good.	Australian Good.	Australian Good.	Australian Poor.	Australian Poor.
Alkalinity	..	1·0	1·4	2·0	10·6	11·3
Nitrogen content ..	1·77	1·52	1·32	1·69	3·42	4·00

Studies were begun on the changes in nitrogen constituents in the plant during growth, through the processes of topping, suckering, and early ripening, and finally during curing.

Curing Investigations.

In order to determine whether the longer curing processes adopted in other countries for heavier types of leaf were applicable to heavier

leaf in Australia, trials in which the curing was more prolonged, especially at lower initial temperatures than is usual, have been in progress at Wangaratta for three years. Smoking tests on this year's trials have not been made, but results from the previous seasons show that with mature, fine-textured leaf there is no advantage in prolonging the curing process at present in use, whereas with heavy and/or immature leaf both colour and quality were improved by a 10-14 days' curing period.

Processing Experiments and Smoking Tests.

Smoking tests are in progress with cured leaf before conditioning and storage for maturation, after maturation but before processing and manufacture, and after manufacture. They are correlated with chemical analyses, curing methods, soil type, climate, &c., and cover the range of samples which the various States have agreed to provide.

Processing experiments were commenced in Sydney about a year ago and some 1,000 lb. of leaf has been conditioned and stored for varying periods of maturation. Preliminary manufacturing tests with 1932 crop leaf involving the use of sugar, honey, liquorice, and such acids as acetic, malic, citric, &c., have been made, and these tend to indicate that smoking quality is improved by such treatments. The work is obviously still in the initial stages.

THE KING AS A FARMER.

His Majesty the King is identified closely, both by inclination and residence, with the farming industry.

Windsor, the traditional home of the Kings of England for centuries past, has always been a centre of the farming activities of the Royal House.

From the early centuries, when Windsor Forest was the hunting preserve of the reigning monarch, we come down to more recent times, when the Home Farms were established on more practical lines. At Windsor there are 175 cattle, 300 breeding ewes, a herd of Middle White sows, and about 1,000 head of poultry.

The cattle comprise pure-bred shorthorns, Herefords, Devons, Jerseys, and non-pedigree dairy shorthorns. The ewes are Border Leicester-Cheviot, crossed with a Southdown ram, and a large white boar is crossed with the middle white sows. Indian game cockerels are used with light Sussex hens in order to provide a good bird for the table.

All the milk, butter, and cream required for the Royal household while in residence at Buckingham Palace or Windsor Castle is sent from the royal farms every morning by road.

About 3,000 acres are farmed by the King at Sandringham, Norfolk, and on no estate in that county is the motto that "Property has its duties as well as its rights" more loyally or practically construed than at Sandringham, and no landowner possessing an estate of such magnitude within the county takes greater interest in its economy or is more conversant with every detail incident to its management.

At Balmoral in the Scottish Highlands, His Majesty has an excellent herd of Highland cattle, which has many victories to its credit. It is not, perhaps, given to this breed to obtain the supreme championship at the fat stock shows, but the King's herd of these picturesque, shaggy Highland cattle is invariably well forward in its breed classes, and has won the breed championship on many occasions both in Edinburgh and London.

The Potato *(Solanum tuberosum)*.

ITS CULTIVATION IN QUEENSLAND.

THE varied climatic conditions and environment under which this crop is produced in Queensland conduce to a close study of local conditions to ensure success. In the potato-growing districts of the Southern States, where there is a recognised spring planting and an autumn harvest, little difficulty is experienced in providing for a supply or change of seed, but, with two distinct crops in the year common to most parts of our State, it is essential that, for one crop at least, imported seed must be secured; and in the more Southern districts contiguous to the coast where a partial immunity from frosts prevails, brought about by a proximity to tidal waters or by specially sheltered or elevated ground, the planting season may commence in July on the warm soils, and the risk is taken with a prospect of high prices for the early crop.

Leaving the coast, August becomes the general month to plant; but on the Downs late frosts put the time back to September; again, in localities within reach of the main railway line in the elevated and more temperate country lying near the New South Wales border, the same reason often delays the planting until October.

To cater for the July or August trade, large quantities of seed potatoes are imported. These may be from any part of the Southern States, where one crop one season is the rule; and the practice of lifting it as soon as ready and disposing of it admits of Queensland merchants securing supplies of "seed" and holding them in a warmer climate for several weeks to encourage the tubers to start into life. Some quick-maturing varieties raised from the early planted fields (July and August) will be available as seed for the following and general February planting.

In the North, the season has to be regulated partly by the monsoons, and planting is usually held over to the winter, until after the wet season.

The diversity of seasons obtainable in the different parts of the State, and the continuity in production going on throughout the year, whilst emphasising a feature of Queensland's agricultural wealth, unattainable in climates of a strictly temperate character, yet lay the way open to the possible introduction of diseases of various kinds from outside sources, as, no matter how carefully the rigid system of inspection applied to imported potatoes and other products likely to carry a nucleus of infection is carried out, it remains that the sooner growers and merchants become alive to the fact and make themselves familiar with the many and varied diseases which the potato is subjected to, and the manner in which these may be minimised, and their distribution checked, the better it will be for all concerned.

While the general details appended concerning the varied phases in the production and marketing of the potato crop may demand some adaptation to individual requirements, too great an emphasis cannot be placed on the marked injurious influences exercised on the potato-growing industry where Irish Blight makes its appearance, unless reasonable precautions are taken to combat such an insidious disease. This State has apparently experienced a greater immunity from the trouble than others, where the devastation of fields throughout whole districts occurred within a few days.

By careful perusal of the descriptions and appearances to be noted in connection with the progress and development of the varying forms of insect and fungus enemies which attack the potato, it is patent that the every-day methods of the grower, and others handling potatoes commercially, require to be regulated by commonsense methods to combat the influences which may act as contributing causes in the spreading of pests and diseases.

A grower in all good faith may have to fall back on bought seed potatoes infected, say, with "scab" (which seems to show up in districts wherever potatoes are grown). If potatoes are untreated for the trouble and are plante in "clean" land, they not only cause a repetition of the disease, but the fungus thus introduced infects the soil for a number of years. A fallacy shared by many growers is that spraying with the usual Bordeaux mixture or other fungicide "cures" Irish Blight, even when it is evident in the crop. Spraying in this instance is not a cure.

The film of fungicide remaining on the plant protects it from spores which may be carried by various agencies from an infected source, and this film, if it thoroughly envelops the growing tissues of a perfectly healthy plant, will be sufficient to kill or check the growth of spores on which the incidence of the disease relies; and the efficacy of the treatment depends on "prevention"—the maintenance of a film throughout the period of growth.

It is a generally accepted belief that certain varieties of potatoes withstand or are inaccessible to the atack of blight, more than others, statements being circulated at times that certain varieties are blight-proof. Experiences seem to point to the fact that when disease does appear in a locality, its effect on "clean" plants is dependent chiefly on environment and the stage reached in their growth, and no definite assertion can yet be made as to whether any variety offers a greater toleration to disease than another.

There is every indication that prices for this commodity will keep up, and are likely to remain so. Farmers who are prepared to take the risks, and give the attention necessary to ensure successful results, may expect a remunerative return.

Numerous varieties of more or less merit, are cultivated in Queensland, and may be classed as either early, medium, or late sorts.

Climate.—No other root crop seems to have such a wide range. It is more of a "temperate" crop, although susceptible readily to frost It is cultivated even in Iceland. In this State it is grown in our coldest district, Stanthorpe, also in the Tropical North; and extensive areas of typical land exist which are suitable for the production of potatoes of the best quality.

Soils.—The best Lucerne and Potato Land are almost synonmous; but the former will thrive on heavier soils and those which become fissured in dry weather. Deep, friable, well-drained, alluvial loams, rich in organic matter and capable of absorbing and retaining moisture, form ideal soil, provided they are situated in a suitable and sufficiently moist climate. Forest and scrub soils approaching this physical condition and naturally enriched by potash from the burning off of timber are also good for potato production. The growth and development of tubers demand a loose soil. Heavy plastic soils, stubborn to work, which crack readily or "set" hard, are unfavourable.

Sandy soils lacking organic matter and the elements for plant nutrition are not suitable for continuous production.

Wet, sour, and clay soils, not naturally aerated, are to be avoided; these have a tendency to produce waxy potatoes of poor quality.

Potatoes show a partiality to properly prepared virgin soils, and the maintaining of a supply of humus is essential for a continuation of payable yields; so it behoves the grower to pay attention to the physical condition of his soil, which is equally if not quite as important as its chemical condition. Examples are to be noted in the alteration of soil texture on some farms after a few years of general cropping; at first, potato crops would thrive well; latterly, and although no marked depreciation in fertility had taken place, a return to the previous yields seems out of the question.

An example may be cited of the influence which "texture" plays on production, when, for instance, an old lucerne paddock is being worked up for potatoes. Unless this is done to allow ample time to weather and mellow down, the soil particles for the most part remain about the size of peas and are incapable of retaining moisture for any length of time, to the consequent reduction of the crop.

Preparation of the Soil.—Whilst the successful raising of marketable crops is dependent largely on the character of the land and the season experienced, the factor in chief lies in its proper preparation.

Hurriedly prepared fields are only courting a partial failure or serious reduction in yield.

Generally speaking, the heaviest falls of rain come in the latter end of the summer, and the winter months are inclined to show averages slightly below normal. Assuming that it is intended to take advantage also of the mellowing and sweetening influences of frost and plant immediately it is safe after the winter, it is imperative that, on virgin soils apart from scrub land, the work of preparation should extend over several months. Operations should be directed in accordance with varying local conditions, but it remains that certain fixed objects must be kept in view—the primary one being tilth, and the secondary a retention of moisture for the approaching planting season and the development of the crop. Any encroachment of weeds or grass on the "fallowing" land will have as its corollary an unsatisfactory condition for all subsequent operations, and, if fouled in this way, the work of the potato-digger is very much hampered.

Cultivate deeply and in accordance with the nature of the soil. On virgin land shallow "breaking-up"—say, in October or early November—with an English type mould-board plough to invert the furrow slice, is commended. Should couch be present, the surface must be worked consistently during the hot weather with the disc and tine harrows to give all the exposure possible to dry it out. If otherwise, roll after the plough, and harrow to fill the interstices between the furrows.

Use the disc harrows just previous to cross ploughing, which should be carried out as soon as grass has rotted down sufficiently, and to a depth of not less than 6 in., which should be increased gradually in the seasons following.

It is inadvisable to create a fine surface tilth at this stage, as if tropical rains are exeprienced much soil washing takes place. Any

inclination to surface crusting will require the early use of the tine or spring-toothed cultivator, which will serve also to keep the land clean.

Manuring for Potatoes.—Potato crops, more than any other, may unquestionably be profitably increased by the use of artificial fertilizers, but, as the crop is dependent quite as much upon the season as upon the fertilizer, it may happen frequently that manuring does not appear to give much better results.

Again, manuring will only be of use if combined with effective cultivation.

The effect of artificial fertilizers may become considerably increased by the addition of farmyard manure, which by itself is one of the best manures for potatoes when applied early as the land is being got ready. As the heavy amounts (10 to 20 tons per acre) of farmyard manure, which would be necessary if used by itself, for a complete dressing, are not always available, smaller quantities of 3 to 6 tons per acre may be used profitably in addition to artificial fertilizers.

As a rule, complete manures give by far the best results, and may even be used in small dressings in comparatively rich soil, and will then prevent their rapid exhaustion.

The dominant manure for potatoes is potash, and it appears that potassium chloride gives better results in some cases than the potassium sulphate. As our soils are generally rather high in chlorides, the use of potassium sulphate is to be preferred, and may be used in quantities from 1 to 2 cwt. per acre, according to the quality of the soil and the presence of available potash.

Nitrogen.—Nitrogen is only required in moderate quantities, and gives the best results if applied in the form of nitrate of lime, cyanamide or nitrolin, or of dried blood, which may be used in quantities from 1 to 2 cwt. per acre. This element has at times a somewhat forcing effect on plants, and under some circumstances may act in a detrimental manner. For instance, should the spring crop receive a check from dry weather just as the tubers are setting and this be followed by thunderstorms and heat, there is an over-luxuriant growth of tops, and the energies of the plant are misdirected with a consequent reduction in yield.

Phosphoric Acid is generally applied, in the form of superphosphate or bonedust, in quantities of from 2 to 4 cwt. per acre.

When a complete mixed fertilizer is to be used, such a one should be chosen which contains from 8 to 12 per cent. of phosphoric acid, 3 to 4 per cent. of nitrogen, and 8 to 9 per cent. of potash, and in quantities of not less than 6 cwt. per acre on soils considered to warrant the application of such dressings. Local conditions vary very much, and are of greatest importance, and even have such an influence on the composition of the soil that an ordinary agricultural analysis may not always be a safe guide; for this reason, small experiment plots are recommended, where the quantity and kind of fertilizers may be gauged to suit the class of soil and other controlling influences. These may be designed as follows:—

1. Unmanured.
2. Nitrogen and potash.
3. Potash and phosphate.
4. Unmanured.
5. Nitrogen, potash, and phosphate.
6. Nitrogen, potash, phosphate, and stable manure.
7. Unmanured.

The Application of Artificial Fertilizers.—A concentrated fertilizer is more readily distributed by mixing it with several times its own bulk of sifted soil. If applied directly to the furrows, the root system of the plants is confined to a more limited space, and the crop will suffer to a greater extent in dry weather than if the fertilizer was spread over the land and ploughed or worked in just previous to planting. This is to be commended when the more slowly assimilable fertilizers are used; for others, exclusive of the most soluble kinds, broadcast the fertilizers over the open furrows before planting. The covering in of the crop will tend to incorporate it with the soil. The soluble fertilizers supplying the nitrogen are usually distributed between the rows by hand when the plants are several inches in height, and this is followed up by scuffling the crop.

Farmyard Manure.—Apart from the manurial constituents contained, it acts as a mechanical improver of the soil, providing humus to surround the soil particles, and preventing plasticity; this, as already noted, is of extreme importance in connection with potato-raising. Usually this class of manure will contain from ½ to 1½ per cent. of useful plant food (N.K.P.), but many things have an influence on its value, for instance, its origin, the manner and length of time it has been stored the nature and quantity of food and litter supplied, and the ages of the animals, &c.

If stored and rotted down in pit or heap, it is reduced to a pasty mass, and much valuable material is lost by fermentation and by its depreciation as a mechanical improver of the soil.

In temperate climates it is customary to apply in drills and plant the potatoes on the manure with satisfactory results; but in this climate it is best carted direct from the sheds to the paddock to be manured, and ploughed in some time before planting. This allows for a more complete decomposition.

Green Manure.—To maintain that loose friable state of the soil so necessary in the production of potatoes, and to improve the mechanical condition of lighter soils deficient in vegetable matter, and of soils which have depreciated in texture from continuous cultivation, the practice of growing and "ploughing in" a leguminous crop as a soil renovator, allowing it to rot down in the season prior to the planting of the potatoes, is commended. Ordinary field and cowpeas are both useful for the purpose—the former adapted for growing from autumn to early spring, and the latter from the latter time to early autumn. Another useful crop for sowing in autumn is rape.

Selection and Condition of Seed.—No matter how well the land has been prepared, if the sets are inferior in quality, a full return cannot be expected; the selection of suitable seed apart from variety has an important bearing upon the success of a crop.

Select from a variety true to type, well grown, uniform in character, and having a clean skin and free from disease; the flesh should be firm to the touch, but yielding slightly under pressure.

The eyes require to be almost level with the surface in most varieties, and particular attention directed to the condition of the buds or young shoots. Sets in a condition to plant should have short robust sprouts; those sowing a long or attenuated growth are to be avoided

Storage in large heaps and a lack in turning the potatoes encourage this condition. Shallow layers are to be preferred with frequent turning, and the picking out of any showing traces of rotting.

The sets for planting are either tubers too small for table use—but graded from a good crop—or those of ordinary commercial size and which have to be cut into sections.

It is generally recognised that, for conditions prevailing over most of the State, whole sets are preferable. Exceptions are to be considered in the event of a possibility of the introduction of disease, when an additional precaution may be taken by cutting, when detection is easier.

For the autumn planting, whole seed is certainly to be recommended. The reason for this lies in the fact that, if wet conditions follow after the planting of cut sets, accompanied by warm weather, the planting may be lost by rotting.

The safest season for "cut" seed is for the August or spring planting, when the soil is colder and generally not so moist.

If whole sets be used, care should be taken to procure from a reliable grower or reputable seed firm.

Plate 9.—Robust "Seed" Potato. Natural Size.

Very small whole potatoes are not likely to give the same results as a more robust sample about 2 in. in diameter. This latter carries a store of nourishment for the young plant, tides it over a dry time, and gives it an earlier start.

For cut seed, moderately sized tubers are to be preferred; nothing is to be gained by making small sets for reasons similar to above, and they are relatively more subject to rot.

Number of Eyes to Set.—Much importance is often placed as to the number of eyes that should be in a set, but this is of much less value than the size of set. Where several eyes may inadvertently be left on a cut set and these start simultaneously into life, or when whole potatoes are used and planted at a seasonable time, the primary shoot assumes control and gives rise generally to one stem. Exceptions occur in backward seed or if planted late in the spring, and when humid weather is experienced; then considerable suckering takes place.

Cutting Seed.—As to the best method of cutting the tuber into sets, it will be observed that at one end of the potato, in most varieties, there

is a bunch of eyes called "the crown." In the case of the smaller-sized potatoes all that is necessary is to cut them in half lengthways and right through the centre of crown, leaving about an equal number of eyes on each side.

With larger-sized potatoes the first cut should be made across its length and about one-third from the end opposite the crown; this "stem" end forms a set; whilst the other section is cut through the centre of crown at right angles to the first cut, making three sets in all.

Extra large potatoes should be cut evenly into four pieces with a regular cut lengthways as before noted, and then crossways or else into pieces containing from two to three eyes and weighing about 2½ oz. each. A thin knife is preferable, and should pass more freely through a seed potato than a crisp table one.

Time to Cut.—This should be done a day previous to planting to allow the raw surface to heal up; a sprinkling of wood ashes or slaked lime is advisable.

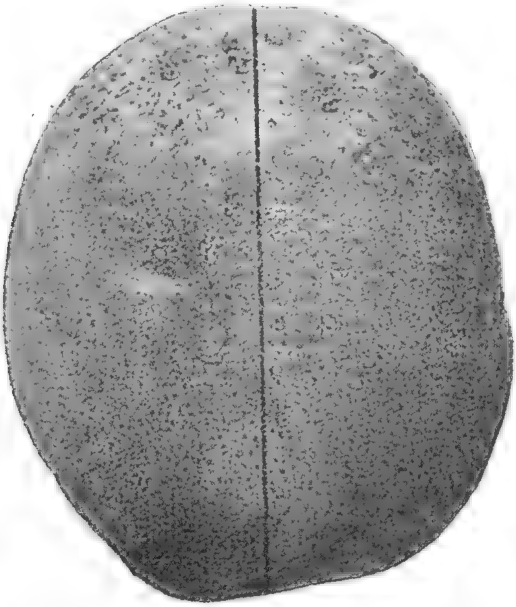

PLATE 10.—"SEED" POTATO CUT TO TWO SETS. NATURAL SIZE.

Sprouting Seed.—Mention has been made previously as to the difficulty of maintaining supplies of seed for the two plantings—July-August and in February—obtainable during the twelve months in this State, necessitating an importation for one planting, as the time between the harvesting of one crop and the planting of the next is so short. Changes of seed from a cooler climate are thus assured, as, if otherwise and an attempt was made to carry on with an early maturing variety, its vitality is soon irredeemably impaired. It is possible to make use of a quick-maturing variety to provide seed for a succeeding planting, provided it is put in early and harvested as soon as "ripe," and then shortly afterwards spreading out the potatoes in a shed or barn in shallow layers to dry thoroughly. Exposure to strong light will turn the colour of skins to a greenish hue, and the process will assist in prolonging their keeping qualities even when planted again.

If bagged subsequently, they will sprout much earlier than if kept in a large heap in a shed, which if moist will have a tendency to cause decay in the potatoes, and when they do sprout the shoots will be nothing like as robust as the treated seed.

Stored potatoes require to be frequently turned and picked over to take out decaying tubers.

Amount of Seed per Acre.—This will vary and depend on the class and size of sets. Usually 7 cwt. to the acre may be taken as an average.

Planting.—It is generally recognised that the earlier the spring crop can be put in, the better the chances of a heavy return, assuming, of course, that conditions are favourable. A late crop, or an unseasonable variety planted at this season, may strike humid weather and have a tendency to produce an over-abundance of haulms and a minimum amount of tubers.

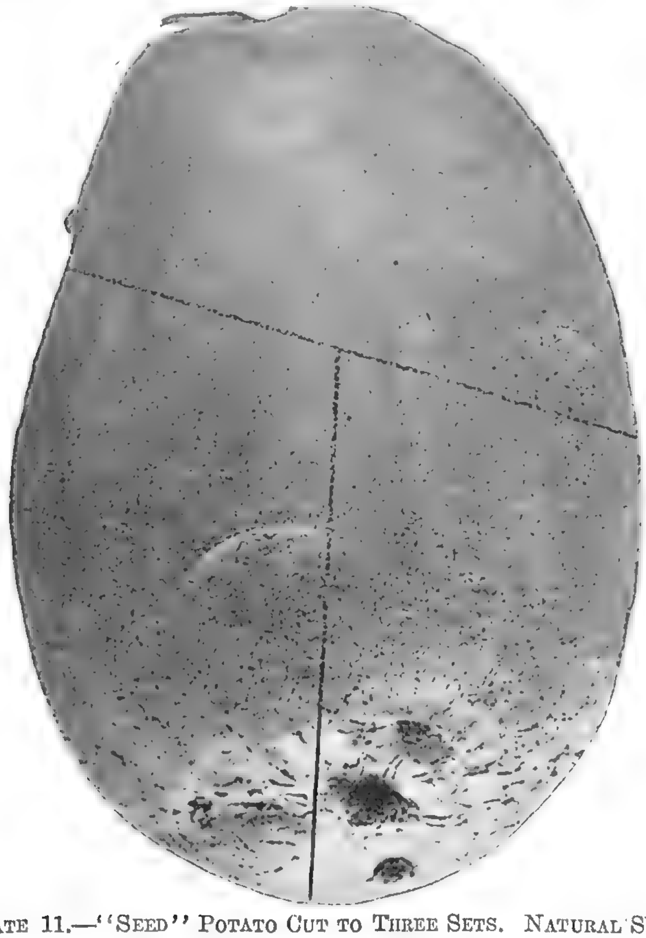

PLATE 11.—"SEED" POTATO CUT TO THREE SETS. NATURAL SIZE.

For the autumn crop, the time is regulated by being put in sufficiently early to allow the tubers to grow and mature before the advent of frost. Whether the crop is to be planted on the flat or ridge will depend largely on the soil and environment. In dry localities, planting and subsequent working should be kept on the flat, the potatoes being planted every 15 in., and at a depth of approximately 4 in. immediately after the plough, and in every third or fourth furrow, according to the width being

cut, so as to bring the rows from 32 to 36 in. apart, and allow for horse cultivation. When ploughed in, whether with disc or other type, it is preferable to plant on the side of the furrow rather than the bottom, to prevent trampling of seed potatoes by horses. For ridge planting, the double mould-board hilling type of plough is to be preferred, but the single plough may be used; in any case the furrows should be planted up and filled in as quickly as possible after opening. Care should be taken in setting the hilling plough so that it will leave a hollow rather than a pointed crown. In the event of the use of fertilizers, reference should be made to the previous notes governing their application.

When opening furrows, undue exposure should be avoided and the planting and covering in arranged simultaneously; three good planters will keep one plough going. Machines may be used with advantage where large areas are planted; these are designed to complete the opening, the planting, and covering in at one operation.

After Cultivation.—The first cultivation should be given just after the young plants show up through the ground. Light lever harrows, with the tines set back from the perpendicular, are to be recommended.

A pair of light home-made harrows, useful for any class of work where "hills" are put up, can be made in a half-moon shape with short tines; these overcome the damage often associated with heavy and flat harrows which do not possess the adjustable tines.

Scuffling between the rows is most important, the ordinary Planet Junior type of machine being used, at least twice. The manner in which the ground has been worked will determine how the tines should be adjusted, so that the earth may be moulded in as desired towards the plants at each cultivation, taking care not to stir too closely or too deeply to disturb the roots.

Where hilling is practised, a special mould-board type of sweep can be attached to the machine for the purpose of combining the two operations at the time of the last stroke of the scuffler. The moulding over of friable soil is important in relation to protecting the tubers from the attack of the potato moth, also to prevent discolouration of potatoes which may be exposed to sunlight, and, if in cold districts where an autumn crop is obtainable, a protection of this character helps to save the potatoes from severe frost bite, if they have to remain any length of time before lifting.

Hilling up with the double-mould plough is advisable in damp positions, and in situations where this class of work is required; and it is equally as important to give the ridges plenty of body and not bring them to a point.

No further horse cultivation is required between the rows after earthing up.

Harvesting.—To anticipate a harvest is to take reasonable precautions other than careful cultural operations to get one, by paying attention to directions laid down, as preventive measures against blight, and the various troubles incidental to potato-growing.

When the crop is sufficiently ripe, this is generally ascertained by the dying down of the haulms, also by the condition of the skin of the potatoes, which should be fairly dry and set, and not readily peeled off.

Early frosts will often hasten the harvesting of the autumn crop, but in the case of the summer-ripening crop, growth is prolonged, and careful

observation is necessary to determine how soon they can be lifted, as the hot weather, and at times the potato moth, make it expedient to harvest as soon as ready. Another reason is that some varieties have a predilection to a second growth.

The means adopted in the harvesting of the crop are many.

The flat-pronged digging fork is still in vogue, but where large fields have to be dealt with it is too slow and expensive, contract prices running from 1s. to 1s. 3d. a bag, and in some cases up to 1s. 6d.

An ordinary single-furrow plough acts fairly well, provided the ground is worked in lands, the side of the furrows on one side of the hill being trimmed off first before ploughing the potatoes out for the "pickers."

A double mould-board plough with a specially shaped pronged share is used largely in some localities, the potatoes being left on the surface after it.

If the ground becomes fouled with weeds or grass, the disc plough may be used, and it is in such situations that a potato-digger cannot operate to any advantage.

Potato-diggers are to be recommended when they can be used on friable soil free from rubbish. Many classes are on the market, some being designed for grading the crop; but, like most machines, they cannot accommodate themselves to all conditions.

Suitable weather and conditions are to be looked for when harvesting; the soil should be sufficiently dry so as not to stick to the tubers, and they should on no account be left lying exposed to the hot sun or to strong winds, which have a damaging effect on their keeping qualities.

Grading.—No grower can afford to neglect this most important feature. The vagaries of the market may at times shatter the good intentions of those who carefully class their products, but it is well known that the law of averages does not apply to a line of mixed-sized potatoes, and a depreciated price has to be accepted when the smaller and unmarketable stuff is included with that of better quality.

With a partly perishable product, there is usually little inducement to hold over for a rise, particularly with the summer crop when the wet season is at hand; and there is, moreover, always a fair and sometimes a heavy percentage of unmarketable potatoes after storing, as well as the extra cost entailed in picking over to be considered.

Potatoes of a regular and uniform size are preferred by the large consumer. The grower who can arrange his grading by a machine or with the "pickers up" in the field does so to his own advantage.

Once in the barn, under cover, sorting-machines certainly facilitate this work; and, if a grower is specialising in seed potatoes, there is some justification in rehandling the "smalls," to cater for the "seed" trade with an even selection of the first grade, and brand up his marketable stuff with his own name or trade mark.

A recommendation has been made that when potatoes are stored they should be kept in thin layers, a dry airy place being preferred. There is little gained in neglecting to protect the open bags of potatoes in the field, as it is here that infestation may readily take place by the potato moth, owing to a practice (which is to be deprecated) of covering the open bags with a bundle of potato haulms.

The Varieties to Grow.—Several references have been made to the seasons and conditions governing the supply of seed potatoes to suit this State's varied requirements.

In recommending varieties it is realised that our climatic conditions preclude the chance of a grower arranging a continuity in the production of one or more kinds where there are two distinct seasons in the year, unless fresh seed is brought in once a year from a cooler climate. The Stanthorpe district climate resembles more than any other that of New England, for instance, and it is quite possible to use seed from an early maturing crop planted there in October, harvest it in March, and hold over for the August planting in warmer localities instead of importing seed. But, although potatoes do remarkably well in some picked spots, the Stanthorpe district (from the nature of its soils) is unlikely to produce, for some time at least, anything approaching a percentage of the seed potatoes required in more favoured potato-growing localities.

Varieties found suitable for the respective divisons are as follows:—

Northern Division—Up-to-Date, Carmen No. 1, Factor, Scottish Triumph, Coronation.

Central Division—Brownell's Beauty, Up-to-Date, Carmen No. 1, Satisfaction, Manhattan, Bismark.

Southern Division—Carmen No. 1, Manhattan, Scottish Triumph, Up-to-Date, Brownell's Beauty, Guyra Blues.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Productive Seed.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

THERE is no question that one of the most important factors contributing to success in Agriculture is the use of highly productive strains of seed.

The subject is one of vital commercial importance, not only to the grower who will receive an increase in yield without extra cost in production and consequent greater monetary return, but to the State, since the return from such primary production is the foundation of the people's prosperity.

Unfortunately, while recognition is given to the value of such a class of seed, too little care, beyond a capacity for satisfactory germination, is paid by the average agriculturist in its selection.

Even amongst the most successful stockbreeders, where, in mating animals every consideration is given to pedigree, prepotency and performance to produce offspring of equal or superior quality in the direction calculated to be the most profitable, there is frequently a neglect to apply even ordinary care in the selection of seed for crops to be grown to feed such stock.

A very little thought should carry conviction that the dominating principles in animal breeding may be applied with equal advantage to plant breeding, and that the capacity for reproduction in quantity and quality can be transmitted by the plant through its seed as well as by the animal through its offspring.

Just as the value of the dairy herd bred for the high production of butter fat is instanced in the bigger monetary return for cream over a herd not so built up, so will the value of a highly productive strain of seed be appreciated in a heavier cropping over seed of average quality.

As interest in the production of the dairy herd naturally leads to consideration of the nutritive quality of the food supplied, so may interest in the use of highly productive strains of seed excite attention to an improvement in the fertility of the soil, better preparation of the seedbed, cleaner cultivation, &c., as well as an improvement all round in farm practice

DEFINITION OF A SEED.

A true seed is defined as the impregnated and matured ovule of a plant containing an embryo which may be developed and converted into an individual more or less similar to that from which it derived its origin. The impregnation of the ovule may have been effected by pollen from the same plant, another of the same variety or species or occasionally from another of a different species of the same genus. Possibly a more appropriate definition for the purpose of this article might be given as "That part of a plant which, separated from its parent suitably treated, is capable of reproducing its kind." In such a category consequently, tubers, bulbs, rhizomes, corms, cuttings, buds and scions could be placed and generally referred to as "buds," since when they are not wholly so, they carry buds, the growth from which constitutes the new plant.

SEED QUALITY.

The external appearance of seeds does not indicate the degree of productiveness, as those of a low yielding strain may appear similar in all respects to others capable of high production. The purity of the seed, however, can to a large degree be noted, especially if a sample is spread under a reading or magnifying glass.

Impurities may then be detected such as dirt, husks, chaff, &c., the weight of which would be a loss to the buyer but not positively injurious. Worse impurities would be foreign seeds and those of noxious weeds, which on account of similarity in size might be difficult to separate, also the spores of fungi that may be present. Regulations under the Pure Seeds Act prescribe a degree of purity (freedom from foreign seeds, deleterious and inert matter) and a particular percentage of germination. This latter varies somewhat with the kind of seed.

Regulations under the Diseases in Plants Act prescribe freedom from disease and insect attack in the case of "seed" of the bud type.

Good seedsmen give guarantees that their supplies will conform to the provisions of the Act. Though advisable, it is not, however, obligatory for the purveyor of seeds to have them tested prior to sale, though a penalty may be incurred if a lot supplied is found not to conform to the provisions of the Act.

The Officer in Charge of the Pure Seeds Branch, Mr. F. B. Coleman, advises that it cannot be too widely known that the Seed Laboratory at Brisbane examines, free of charge, all samples representing seeds that farmers have purchased for their own sowing, providing all samples are plainly written on in ink, setting out the undermentioned particulars:—

(1) Name under which the seed was purchased, or is proposed to be sold;

(2) The number of bags from which the sample was drawn, and the number of bags in the whole consignment;

(3) The marks of identification, if any, on such bags;

(4) The name and address of the sender, with date of sampling;

(5) If the sender is not the actual grower, the name and address of the sender's supplier, with date of delivery.

Samples should be addressed as follows:—

Seed Sample for Examination.
Officer in Charge,
Seed Laboratory,
Department of Agriculture,
William Street,
Brisbane.

The sender's name and address and the particulars as before set out must be written in ink on the actual container.

Special care should be taken to securely fasten up the sample. The examination of samples received at the Laboratory that have been opened in transit is useless for any determination, as only a sample received intact can be taken as representing any bulk.

Certain seedsmen of high repute in addition to the guarantee of purity and viability also give an assurance that their seed is true to name and will reproduce true to type. Not one, however, will guarantee a satisfactory return, as this is so largely determined by soil, season, and the cultural methods of the grower.

In addition to the purity, as regards freedom from foreign matter, and capacity for germination of the sample, the following observations should be made.

Size.

It seems to be a true test that the larger the size of the seed, the better plant it will produce. The embryo root will be much stronger and become better established in the seedbed when the food supply of the seed is exhausted. Of two samples of the same kind it would therefore be advisable to select the larger.

Colour.

Frequently the colour of seed is an index to the purity of a variety. Seeds of some varieties of plants, such as maize, may show the result of pollination by another variety in the colour of the seed thereby produced. This, however, is not the case with the majority of seeds, which only show a cross in the consequent plants. Colour should be normal to the variety or species as known from experience or description. Many seeds possess a natural brightness or lustre; in these cases a dull appearance will suggest deterioration due to age, storage with too high a moisture content, harvesting under-ripe or from the effect of disease.

Shape.

The shape of the seeds should agree with that of the variety. Plumpness can be regarded as indicative of good and healthy growth. Shrivelled skins and a shape not normal to the variety can be regarded as signs of inferiority. Pinched or shrivelled appearances suggest an inward weakness caused by adverse climatic conditions, unripeness when harvested or by attack of insects or the result of disease.

Weight.

This is not always reflected in size, for some hard coated seeds may possess a shrivelled appearance within—nuts are a good example of this. The weight of equally measured samples would suggest the superiority of the heaviest. Lightweight seeds may be due to the same cause as a shrivelled appearance. Immaturity at harvest is a most frequent cause. Exposure to drying winds, bad weather, bad storage conditions, insect attack and disease are all factors in weight reduction.

Smell.

This is quite a good guide with some species to the freshness and in certain cases to the purity of the seed. The presence of spores of certain fungi—cereal smuts, &c.—may also be detected at times by the sense of smell.

Viability.

The germinating capacity of seed is, of course, of most importance. In the Pure Seeds Act, as previously noted, a minimum percentage for each kind of seed is prescribed. External appearances cannot be taken as a guide. Every species has a more or less regular life limit, which

has been tabulated after the result of many experiments. Such life limits, however, may be adversely affected by unsuitable treatment or storage under improper conditions. They may also be lowered by the conditions under which they were raised. Poorly developed plants and those suffering from disease or insect attack may produce seed of acceptable appearance but with a weak embryo. Such seed cannot be expected to possess a vitality equal to that raised under ideal conditions. Ripeness at harvest is just as important in this relation as in others. Ripe seed will retain its vitality for a longer period than unripe. In addition to capacity for germination, the strength of the embryo in regard to extension of growth materially adds to seed quality. Generally speaking, the maximum germinating capacity of any kind of seed can be considered as within a year from its harvest.

Price.

When seed is purchased cost should not, as it too frequently is, be the determining factor. Cheap seed should be viewed with suspicion, even when it is free from impurities, and gives the percentage of germination demanded by the Pure Seeds Act. Where care in selection is exercised with a view to increased production price must necessarily be advanced well beyond that of the commercial article. In addition, the reputation of the purveyor should be taken into consideration. Generally speaking, firms of seedsmen that have been established for a considerable number of years can be expected to have built up their business by fair dealing. The best of these have areas for testing varieties and for breeding up strains thereof with a view to improved production, disease resistance, &c. They also enter into agreements with approved farmers to grow crops from seed supplied in order to secure adequate stocks of pure seed.

Productive Capacity.

Though a seed sample may conform to the provisions of the Pure Seeds Act in viability and freedom from impurities and be attractive as regards size, shape, weight and colour, the productive capacity of the resultant plants cannot be gauged unless the history of the seed is known. If it has been derived from a heavy-yielding crop of a pure variety, where there was no possibility of pollination from another variety, the advantage is obvious.

Suitable Varieties.

While a particular variety of a crop may yield well on different classes of soil and under varying seasonal conditions, it does not follow that it will prove the most productive on every class of soil or under all conditions of climate.

Soils vary in texture from heavy clays to light sandy loams as well as in their degree of fertility. Some are of good depth, others shallow. Some are naturally well drained, others less so or with a retentive clay subsoil. While lack of fertility can be overcome by manuring and drainage be improved, texture can be but slightly modified. Climates and average seasonal rainfalls are also controlling factors.

It is reasonable to suppose that particular varieties will be found to excel on heavy soils, others on light, some under a good, well distributed rainfall, others under lighter precipitations. Some will

be of value through early maturity and others more profitable owing to a longer growing season.

The progressive farmer will seek to determine the variety or strain of a variety most suited to his conditions of soil and climate. This he may effect through the experience of his neighbours and by comparative trials over a number of seasons. Having arrived at a conclusion he will satisfy himself of a reliable source of supply or raise his own requirements. In the latter he will have opportunity by selection to improve the strain, not only in yield and quality but in other directions.

PLANT BREEDING.

All cultivated plants have reached their present degree of productivity as a result of seed or bud selection, some present varieties having been developed from an original stock by careful selection and cultivation during the course of a comparatively few years, while others are the outcome of centuries of gradual improvement. It is natural to suppose that the improvement of plants grown for food purposes by seed selection commenced very shortly after primitive man evolved the idea of cultivation. Such a practice would be very ancient and antedate all records, for the earliest so far discovered refer to crop production and cultivation as a more or less general pursuit. Propagation and improvement by bud selection would doubtless be of somewhat later development, yet ancient writings refer to the practice having reached a high standard in Syria and Persia centuries before the dawn of the Christian era. Professor Hehn[1], in discussing the introduction of plants and animals from Asia to Europe, gleans much of interest in this connection from the classical literature of Ancient Greece and Rome. From this he quotes "The Syrian slaves brought with them, besides other sensual perversions of the East, the oriental subtleties in the treatment of animals and plants. Not only castration, circumcision, and the breeding of mongrel beasts (mules) but the lopping and dwarfing of trees and crossing of species by imping and grafting had been early practised in Syria. Purposely produced monstrosities, a careful perpetuation of freaks of nature, an artful sporting with the power of growth—all this was indeed only the same impulse in a depraved form as that which originally made the olive and the date palm fruitful, invented the caprification of the fig, produced double roses and violets and so on."

Plant improvement, therefore, cannot be considered as an art of modern achievement, for it may be possible in former civilisations, wherein there is evidence of work in that direction being accomplished, varieties of certain crops may have been evolved of equal quality to some of those in present use, and arts in breeding understood which were lost in the vicissitudes attendant upon their decline.

Plant-breeding is a term recently brought into use to cover all operations and processes in the propagation of new varieties and the improvement of others, such as hydridising, cross-breeding, and seed and bud selection.

Though cross-breeding and seed and bud selection were practised to some extent previously, general interest in plant-breeding was not aroused until after the publication of the investigations and observations

[1] Wanderings of Plants and Animals—Hehn and Stallybrass, International Library.

of Charles Darwin, during the latter half of last century, in which he suggested a principle of the variability of plants when under cultivation and the influence of continued selection in the origin of species.

This interest was later intensified by the results achieved in hydridising, by which new forms of plants were evolved. Discussions on these led to most exaggerated statements and claims of a most surprising nature being made by irresponsible persons as to the possibility of influencing nature to our will. It is a coincidence that Hehn[1] mentions the same sensationalism as existent in ancient Rome just after the art of budding and grafting was introduced from Syria some 2,000 years ago, as he quotes Pliny[2] professing to have seen a tree that bore on its different branches, nuts, olives, grapes, pears, figs, pomegranates, and several sorts of apples, all at once. The manifest absurdity of Pliny's statement is almost equalled to-day in the extravagant views in other directions frequently expressed by persons insufficiently versed in the subject.

During the closing decade of last century an almost world-wide recognition was given to the practicability of a systematic improvement in the production of the many plants that are cultivated to supply the requirements of the human race. Various governments established plant-breeding stations and to-day the principles of plant-breeding are part of the scheme of instruction at all scholastic institutions, where a knowledge of the subjects pertaining to agriculture is chiefly imparted.

The Government of the State of Queensland was not behindhand in this respect, as State farms, experiment and plant-breeding stations were established in different parts of the State and a trained staff employed in the Department of Agriculture to afford advice and instruction to men on the land in every phase of agricultural endeavour.

Special attention has been and still is paid to plant-breeding, particularly wheat and maize. Of the former many new varieties to suit various local conditions have been successfully raised, while in the latter by judicious selection the productiveness of a number of varieties has been much increased. A great many other crops receive attention, of which small quantities of seed of pure productive strains are made available to farmers.

The science of plant-breeding may be defined as a knowledge of the limitations imposed by nature in the modification or improvement of plants. Particularly is this true in the evolution of new plants by hybridising or cross-pollination. In this connection though crossing of varieties and occasionally of species may be more or less easily effected, it does not follow that the resultant plant will be an improvement on either of the parents or, if so, that such improvement will persist in future generations. Where propagation can be effected by buds, of course, perpetuation of the new plant is more certain.

A very special knowledge is required to allow even a modicum of success in raising a new variety by cross-breeding. When consideration is given to the many thousands of crosses annually effected in the plant-breeding stations throughout the world and the very few worthwhile varieties that are evolved over a period of years, it will be realised the breeding of new plants is attended with considerable cost and much

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[1] Wanderings of Plants and Animals—Hehn and Stallybrass, International Library.

[2] Pliny—23-79 A.D., in *Historia naturalis*.

disappointment. In view of this the individual farming for profit will be well advised to leave such to specially trained officers employed at plant-breeding stations established and maintained at the country's expense. His advantage will be found in the breeding up by careful selection of an established variety found most suited to his conditions of soil and climate.

The art of plant-breeding, as in animal-breeding, lies in the selection of the parents with a view to perpetuating purity and increasing productiveness while maintaining or improving constitutional vigour and disease-resistance.

In animal reproduction it is necessary that there shall be two parents. With plants, however, this is not always the rule. Some, the majority of those cultivated, are bisexual, in that the flowers are complete, carrying both male and female organs—wheat, oats, barley, peas, beans, &c., are well-known examples.

Others, termed monoecious, have male and female flowers borne separately on the same plant, as in maize, pumpkin, &c. Still others are dioecious, having male and female flowers borne on separate plants, as with the pawpaws.

Cross fertilization is effected when the pollen from the flower of one plant is transferred to the stigma of another, as by insects, wind, or other mechanical agencies.

Where the flowers on a plant are bisexual and the anthers close to the stigma, transference of the pollen from one plant to another or cross-fertilization is, according to the plant, usually uncommon. Such transference is mainly due to visiting insects and occasionally to wind. Natural crosses of wheat, for example, are rare, even when varieties are grown in close proximity. On the other hand, crosses of sorghum are common, especially with plants near by.

Plants with complete or bisexual flowers are intended by nature for self-fertilization (selfing or inbreeding), as it is found desirable characteristics are not thereby impaired.

In the case of plants, however, where male and female flowers are separately borne, it is evident that cross-fertilization is desirable. With such plants continued selfing or inbreeding causes rapid deterioration. both in vigor of plant and productiveness.

With this knowledge the breeder, acting on the principle that like begets like, can, with plants in the first category, select individuals of outstanding merit, and by hooding the flower head before the flowers have opened secure seed that is certain to be free from pollination by another plant.

With those in the next, however, greater care must be exercised in seeing that pollination can only be effected from plants of equal merit as regards purity of strain, vigour, and productiveness.

Seed Propagation Plots.

In both classes it is advisable, except in an odd instance of the first, such as tobacco, where selection can be made in the field, to institute seed propagation plots, which would be sown with the best available seed. It is important that the seed selected in the first instance for breeding-up should be of a fixed or pure variety. If it is the unfixed product of a cross it will be liable to follow Mendel's laws and cause

much disappointment. Assistance in the selection of a pure or fixed strain will be available from the Department of Agriculture.

Isolation.

In order to prevent possibility of pollination by another variety, the seed propagation plot should be sown at a time which will allow of flowering at least three weeks before the main crop or another of a similar kind. A better practice, where possible, would be not only to sow the plot so much earlier but to grow it at such a distance from another as to disallow transference of pollen. The distance over which pollen can be carried by wind or insect has not been determined, but an instance of cross-pollination of maize was personally observed where the crops were half a mile apart.

Roguing Out.

To secure the best seed which will be most likely to transmit desirable characteristics it is imperative that not only must cross-pollination from another variety be prohibited, but also from individuals from the same strain showing departure from type or weakness in any direction.

Careful attention should, therefore, be paid to the propagation plot to eliminate the latter and allow only those agreeing with the adopted standard to flower and set seed.

Lines of Selection.

In every propagation plot it will usually be found that one or more individuals show superiority over the rest of the plants therein. The seed from these should be separately saved to sow the propagation plot next season, while that from the balance of the plot is used for the main crop. Following this procedure it can be expected that vigour of plant, disease resistance, and productivity on desirable lines will be enhanced.

Disease-Resistance.

Disease is not a natural concomitant of either plants or animals, as each is endowed with a resistance thereto proportionate to its constitutional rigour. When vitality is lowered by improper breeding, insufficient nourishment, particularly in early growth or other causes, the natural resistance is impaired, rendering the individual more susceptible to attack.

It is obvious, therefore, that in selecting plants for special seed purposes, health and vigour of growth should merit first consideration. Success cannot be anticipated if seed is selected from ill-nourished or diseased plants.

Type.

In every crop there are several features contributing to excellence in the product of which prominence in one or more may be said to constitute a type or strain. These may be exemplified in habit of growth, earliness or lateness in reaching maturity, abundance of leafage or its size and texture, fineness of stem, greater succulence, uniformity of size, shape and colour, flavour, milling quality, &c., &c., according to the crop.

Type should suggest quality, hence its importance and the necessity for perpetuation by careful seed selection.

In breeding-up it is most important that the seed selected in the first instance shall be of a fixed or pure strain. Should it not be so,

departures from type will be frequent and a special knowledge and ability be required for selection to allow of improvement. With the purest strains slight variations are not infrequent; some may show a decline in quality and others an advance. With a true conception of the objective in mind selection from the latter should not be difficult.

Yield.

In the selection of seed from special plants for the propagation plot, the quality of productiveness will naturally be sought. The quantity of yield, however, should not exclude consideration of its quality, as frequently a lower yield of higher quality is more remunerative. In other words, the monetary return that might be expected from the yield should influence the decision.

Bud Selection.

Perpetuation of type by bud selection is much more certain than by actual seed. Selection, however, whether as tuber, bulb, rhizome, corm, cutting, bud, or scion should receive careful consideration, not only in regard to vigour and freedom from disease but to the extent and quality in productiveness of the parent. Where the bud or scion is to be grown on a stock care should be exercised in seeing that such stock is suitable and that it is healthy and disease-resistant.

Lack of care in bud selection is frequently responsible for decrease in yields as well as perpetuation of disease. A common example of this may be noted in potato crops when the "smalls" are set aside to produce the next crop without regard to the health or productiveness of the parent. As like tends to beget like it may be expected the return from "seed" of a potato plant producing a majority of smalls will be hardly likely to improve on the parent. Selections wholly from parents producing quantity with quality can be calculated to improve yields and dispel the illusion that change of seed is periodically necessary in case the crop should "run out."

Soil and Culture.

It is not to be expected that any highly productive strain of seed will give a satisfactory return on poor soil under indifferent cultivation in either a poor or good season.

The soil of the propagation plot, as well as that for the main crop, should at least be reasonably fertile and receive proper cultivation. The result of extra attention towards the latter in the seed selection plot is calculated to influence improvement on that usual in the field.

Reserve Supply.

In order to obviate loss of selected seed through disaster after sowing, it is advisable to hold each season a quantity in reserve. This should be held under proper conditions that will not permit of deterioration.

Pedigree Seed.

The progressive dairyman who by careful selection and mating has painstakingly built up a highly productive herd may point with pride to the increased profit therefrom, also to the consequent demand experienced for young animals of his breeding. Is it not equally or more practicable for the farmer to build up a strain of highly productive seed by careful selection each season and to point with equal pride to his increase in profit and also to the demand for his seed?

The Buckscraper.

A USEFUL IMPLEMENT IN FARM, ORCHARD, AND OTHER WORK.*

THE several sketches given will serve to illustrate such a scoop, or buckscraper, as it is usually called, and is the implement mostly in use in parts of California and Victoria where large tracts of land have had to be levelled for orchard purposes, lucerne, &c. It has also been found useful for grading roads and making channels and earthen fills; it is most handy for making and cleaning out stock-tanks; in fact, it is claimed to be the best scoop for general use by all who have ever used it. Any blacksmith can easily make the necessary ironwork, and the woodwork can be put together by any handy man. The buckscraper, as we shall call it, may be made in two sizes; the smaller size 4 feet long, for two horses, and the larger size 7 feet long, for four horses.

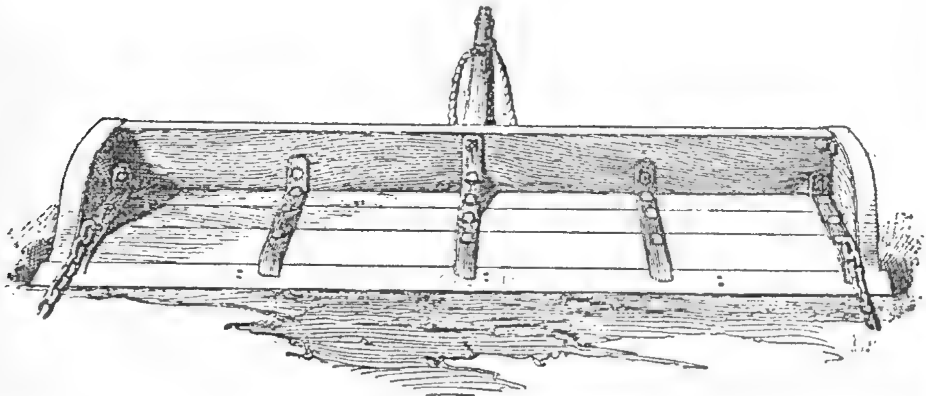


PLATE 12.

Plate 12 illustrates the inside of the scoop before being filled, showing the handle at the back, and the two chains, one at either end, by which it is drawn; the larger size having two horses hitched to each chain, and the smaller only one horse to each chain. The chains by which the buckscraper is drawn are 2 ft. 9 in. long, with a large ring at the end for convenience in hooking on the swings.

Plate 13 shows the bottom and end of the buckscraper, and gives a fair idea as to how the implement is constructed. There are two runners, or rockers, which serve to carry the weight when the scoop is filled. These are shod with steel. When empty, it is usually drawn along (as shown in Plate 13) until ready to fill, the ends acting as runners. These also are shod, to prevent the woodwork from wearing out. There is a 3-in. rope attached to the end of the handle; this for convenience in bringing the buckscraper into position for filling. The driver, by placing his foot on the blade—which, when the scoop is in Plate 13 position, is touching the ground at the back—and giving the rope a sharp pull, will easily bring it into position for filling. For the purpose of dumping out the earth, he raises the handle gradually while

*Adapted from an article by W. J. Allen in the "Agricultural Gazette" of New South Wales for March, 1907.

the horses are moving, the earth emptying itself slowly and being evenly distributed over the surface of the ground, instead of being dumped in a heap, as is ordinarily the case with scoops. This is a great help in doing fine work, such as the final levelling of the land for orchard or lucerne, where it is necessary to have a perfect grade for irrigating, or for roads, fills, &c. The driver will probably take a day or two to become used to the implement, but when he does so he will not change it for any other, as earth is quickly and cheaply removed by it.

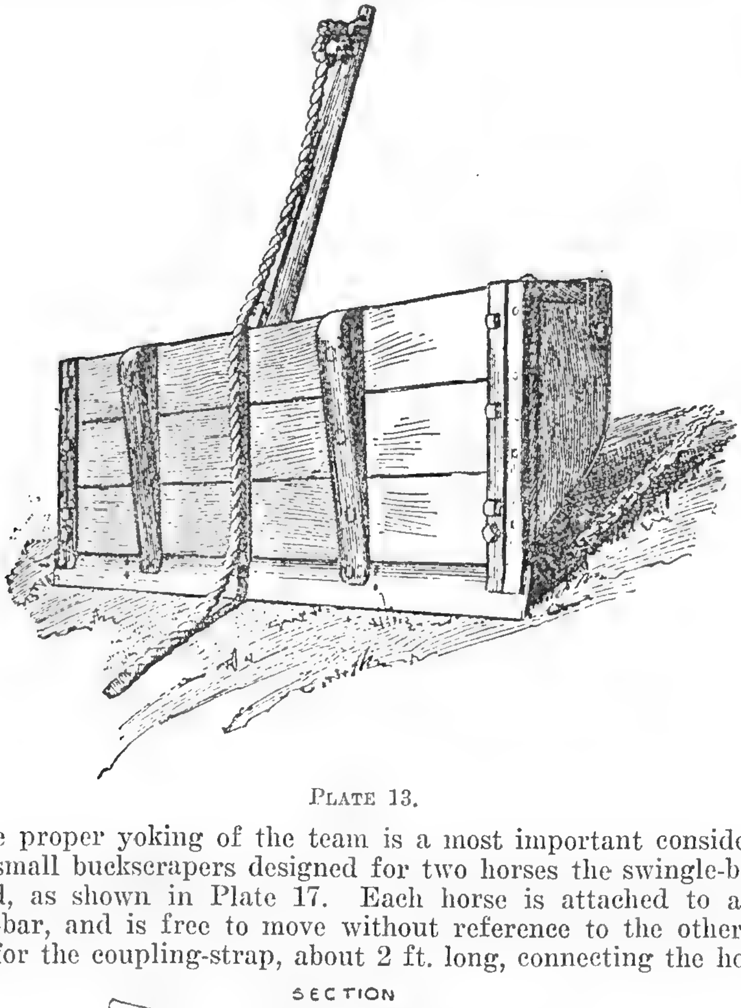


PLATE 13.

The proper yoking of the team is a most important consideration. In the small buckscrapers designed for two horses the swingle-bars are attached, as shown in Plate 17. Each horse is attached to a single swingle-bar, and is free to move without reference to the other horse, except for the coupling-strap, about 2 ft. long, connecting the horses at

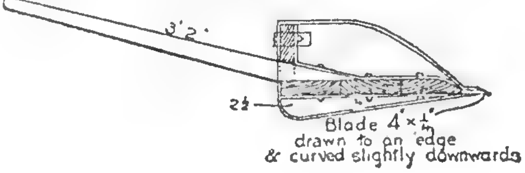


PLATE 14.

the hames. With four horses, they are yoked abreast, but each pair is attached separately to the draw-chains by means of an ordinary set of two-horse swingle-bars (see Plate 18). The four horses are connected at the hames to prevent them see-sawing; it also saves the driver, and enables him to control the team better, if the horses are also connected

at the bits by a strap or short length of rope; these are better fitted with proper snap-hooks that are quickly undone. One man performs the

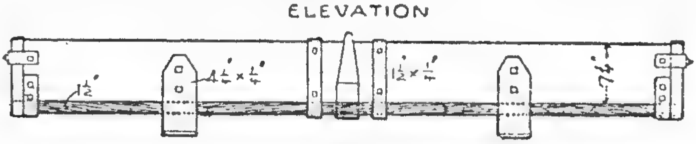


PLATE 15.

whole operation of driving and working the scoop. By using leather reins, of a proper length, driving and turning is easily done. By holding the reins with the hand, and using the upper portion of the arm as a lever, a team of four horses can be turned in an instant, and

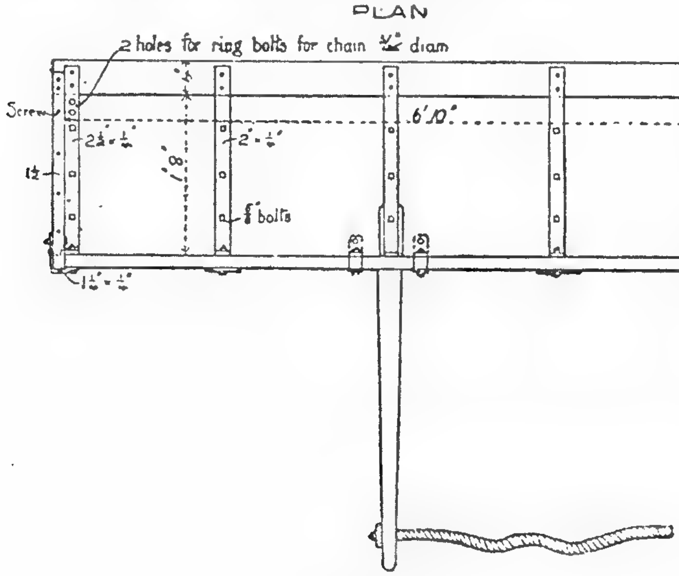


PLATE 16.

much better work done than is possible where one man drives and the other works the scoop.

It is strongly advised that leather traces be used, as little trouble from chafing will occur, notwithstanding the great amount of turning and the narrowness of the swingle-bars; but if chains are used, they should be covered with basil or bagging. In yoking-up, do not have the traces longer than is necessary for the team to walk without hitting the bars. Use back-bands, and let the team learn to get back in their places themselves when they get a leg over the traces. They soon learn, and it saves a great deal of time. The buck-scraper when full of earth should ride on the runners without digging into the ground, and when empty should be light on the hand, so that little heavy lifting has to be done by the operator. A properly-balanced buckscraper depends on the

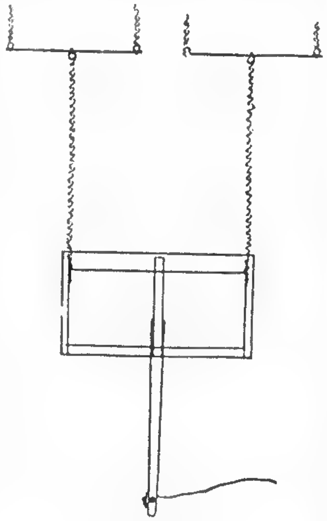


PLATE 17.

position of the eye-bolt attachments for the draw-chains and the way the team is yoked-up.

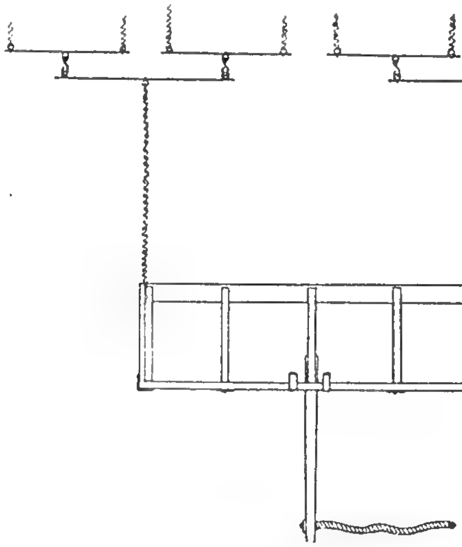


Plate 18.

Very slight alterations in these particulars may make all the difference between a clumsy machine and one that is easy to work.

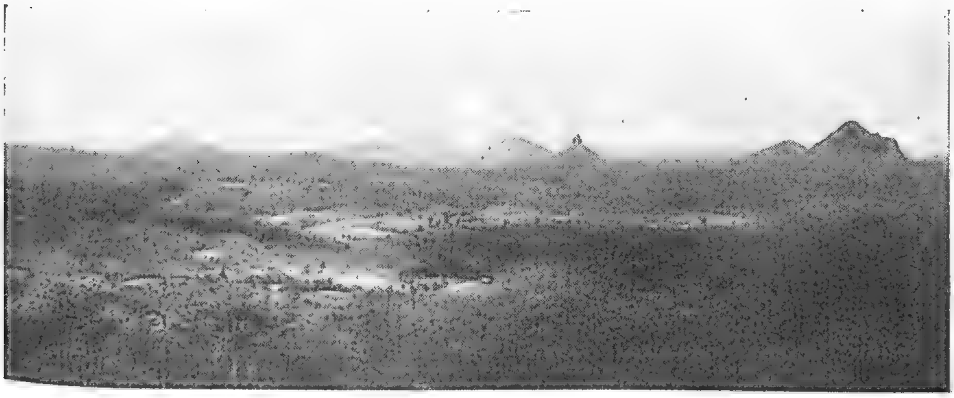


Plate 19.—On the Blackall Range, near Brisbane.

Dairy lands on the near North Coast looking across from Maleny to the Glass House Mountains, named by Captain Cook.

APPLE INDUSTRY.

Scientific Problems.

The Australian Agricultural Council has received a comprehensive report on the economic and scientific problems of the apple industry from the Council for Scientific and Industrial Research. This follows:—

INVESTIGATIONS into the various types of disorders which affect different varieties of apples in storage are being conducted in Tasmania by Mr. W. M. Carne, of the Division of Plant Industry, working in co-operation with the Tasmanian Department of Agriculture and the University of Tasmania. These disorders, which are of a very complex nature, are being determined and classified. Definite information is being obtained regarding the conditions under which they are developed, and methods of control are being studied. The investigations are of importance not only with respect to the apple industry but also in connection with the elimination of unprofitable or undesirable varieties of apples.

Studies of the effects of seasonal climate on the quality and storage capacity of apples are being conducted in conjunction with those on maturity, size of crop, &c., and whilst the effects are obviously difficult to determine, in some cases definite correlations have been found. For example, severe water-core accompanies heat waves in the fruit growing season, and crinkle follows if the hot conditions are severe and prolonged. If the heat wave occurs during or just prior to picking, so that when picked the fruit has water-core, it will develop breakdown in storage.

Bearing Problems.

Investigations are also being conducted into the problem of alternate light and heavy bearing of apple trees. Except in a few instances neither manurial, pruning, nor fruit thinning practices have given any satisfactory results with respect to this problem, either in Australia or elsewhere. In the hope that the investigation into the process of fruit bud formation might indicate a point of attack on this problem the

Council's Division of Plant Industry has, in co-operation with the Victorian and South Australian Departments of Agriculture, made studies of the process of fruit bud formation, and the relation of this process to the growth of the tree in apple varieties of both biennial and annual cropping habits. The information thus obtained, whilst increasing our knowledge of the mechanism of the process, emphasises the difficulty of controlling the biennial cropping habit by means of cultural operations performed subsequent to blossom time.

Two lines of further investigations are indicated:—

(i.) The development of a commercial method whereby the heavy blossom of the "on" year may be reduced to an amount sufficient to set a moderate crop.

(ii.) The discovery of strains of varieties, in which the feature alternation is not so pronounced (vide citrus). A search of established orchards may result in the discovery of strains possessing the quality of even cropping.

Stanthorpe Stocks.

In co-operation with the Committee of Direction of Fruit Marketing of Queensland and the Department of Agriculture, an investigation has recently been commenced at Stanthorpe into the question of the type of stock most suited to the requirements of that district. Certain East Malling Stocks are being used and compared with other stocks such as Northern Spy and seedling stocks, but it will be some years before results are likely to be available.

Cold Store Wastage.

The different types of wastage occurring in Jonathan apples in cold storage and the conditions giving rise to them are being studied intensively in co-operation with the Victorian Department of Agriculture at the Government Cool Stores, Melbourne. The object of the investigations is to determine the effect of maturity, locality, and tree individuality on the keeping qualities of the apple. Satisfactory progress has been made in the work, and it is anticipated that before long it will be possible as a result of the investigations to make definite recommendations regarding Jonathan apples for export, particularly in regard to the degree of maturity at picking.

Apple Cases.

The Council's Division of Forest Products, in co-operation with the Standards Association of Australia, has conducted an extensive series of experiments into the most suitable type of case for apple exports. The evidence which was obtained showed that different types of cases were used in the apple export trade and that serious inconvenience in production, packing, and stowing, and adverse comment in marketing resulted. The first step was, therefore, the elimination of a number of undesirable types of cases following on action which had already been taken in this direction by the Apple and Pear Export Council.

Under the Commerce Regulations two types of cases are now permitted, viz., the Canadian and the dump. The Regulations are, however, of a broad nature regarding variations in capacity, and in addition make no provision for the sizes of the individual parts of the case. Commercial cases are accordingly at present far from being standardised.

The results of the experiment showed that a case of the dump shape, enlarged from the statutory $8\frac{5}{8}$ in. width to 9 in. in order to accommodate the minimum weight of fruit required by overseas buyers, gave the best protection to its contents. An experimental shipment of 540 cases was made by the Council in 1934, but the results were inconclusive. Apparently any difference in respect to liability to bruising which might have existed between the two types of case was hidden by undetermined causes of bruising more important than the type of case.

The Council for Scientific and Industrial Research and the Special Committee on fruit cases appointed by the Standards Association of Australia have undertaken sufficiently detailed tests and export trials to show that the question of standardisation of the apple case is influenced at present by factors other than the protective value of the cases. It appears that the industry should make the next decision as to how largely bruising affects the sales value of apple consignments. It should then take the necessary steps to choose a standard which will give the requisite degree of protection and at the same time fulfil the majority of the marketing requirements.

PLATE 20.—MONSTERA DELICIOSA FRUIT, BUDERIM MOUNTAIN, QUEENSLAND.

THE QUEENSLAND NUT IN THE TROPICS.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE native habitat of the Queensland nut (*Macadamia ternifolia*) is entirely sub-tropical, and in those latitudes it thrives naturally in the virgin jungles. It will therefore be readily understood that in planting the tree in open situations under the fierce tropical sun of North Queensland coastal regions, a wide departure is made from normal conditions.

In the early stages of growth trees often suffer under these foreign conditions. The excessive heat of the sun provides the greatest hardship, and frequently proves fatal with the young seedlings. Even in shaded seed-beds seedlings have been noticed succumbing from the effects of the late afternoon sun striking them beneath the shelter.

At times also heavy losses are experienced with trees up to about five years old. During the hot months of the year sun-scalded foliage is frequently met with; in fact, an unaffected tree is the exception.

During January and February of this year, when excessively hot and dry conditions prevailed, numbers of trees were killed through sun burning of the main stems, the characteristic injury being the drying out of a ring of bark about 2 inches wide just above ground level.

Shade appears to be an absolute essential for success in establishing this tree under tropical conditions. In raising the seed it appears necessary to shade the bed from all but the early morning sun. After transplanting, shading of the trees is needed, and for this some cover crop should be considered. Plots of nut trees have been noticed making good healthy growth whilst overgrown with weeds, but although such a growth has given good results it cannot be recommended in place of a farm crop. Of the latter a leguminous crop of fairly robust growth should receive the first consideration. A crop of such a nature, after having served its purpose as a protective covering for the young orchard, may be ploughed under during the late autumn or simply allowed to remain on the ground and rot down, and thus improve the humic content of the soil—a very necessary matter for consideration under tropical conditions, where leaching and burning out of humus is both rapid and heavy.

Occasionally nut trees have been noted set out in banana plantations, and this method of establishing the orchard has much to recommend it. The growth of the young trees must be watched, however, as the type of shade provided by a banana plantation is inclined to induce spindly growth, any tendency to which must be checked by regulation of the shade.

In regard to the transplanting of the young trees Mr. B. Barnacle, a Queensland nut enthusiast of Cairns, has found the best results are obtained if the plants are moved when not less than 15 inches high, and at the commencement of a period of growth. If transplanted in the dormant stage they remain dormant for a considerable time, and when growth does start it is often of a stunted nature.

Up to the present time all the seed and young trees planted in North Queensland have been obtained from the southern part of the State. Probably, with the raising of stock from locally produced nuts, trees more acclimatised to tropical conditions will be obtained.

FROST PREVENTION BY ORCHARD HEATING.

By R. L. PREST, Instructor in Fruit Culture.*

IN Queensland destructive frosts are not nearly so frequent as in some other States or in other parts of the world. Nevertheless, serious losses are occasioned at times to early fruiting varieties by late frosts, and though, generally, the expense attached to orchard-heating is too high, it would at times be well worth the expense of occasional heating in those orchards where late frosts periodically occur.

Frost Formation.

With regard to the principles of frost formation, everybody knows that this phenomenon occurs when the temperature falls below 32 deg. Fahrenheit. What is known as a white frost is the accompaniment of a deposit of white ice crystals on exposed surfaces. A black frost is characterised by the absence of white crystals and is usually regarded as being the more severe in the causation of damage to plant life.

During the day time the heat from the sun comes to the earth in the form of waves, a method of heat transfer which is known as radiation. By the same process of radiation the earth loses heat continuously both day and night, but during daylight the amount of heat absorbed is greater than that given off into space, and the temperature of the earth becomes higher than that of the air in contact with it. As soon as this occurs, the layer in contact with the earth surface becomes warmer than the air at higher elevations. Heated air is lighter than cold air, and as soon as the air in contact with the earth's surface becomes warmer than that above or surrounding it, it is forced upward, and colder air rushes in to take its place. Circulation is thus established, in which the cool upper air is continually replacing the heated air near the ground. By sunset the air to a height of several hundred feet has been warmed. After sunset no heat is received from the sun, and the earth rapidly cools and becomes colder than the layer of air in contact with it. Heat is then conducted from the air to the ground, and the surface layer of air soon becomes colder than the air a few feet above. In this instance, however, the cooled air being heavier than the warmer air higher up, the tendency is for the same air to remain in contact with the ground all night. Since air conducts heat very slowly, atmospheric cooling does not extend to great heights, as a result of which the temperature of the air 300 feet above the ground changes but little during the night. Thus, over a flat piece of ground on a clear calm night there is a relatively thin layer of cold air near the ground with an increase of temperature up to an altitude of several hundred feet, above which the air becomes colder the higher one ascends. There is thus formed a sort of atmospheric ceiling, the existence of which is of very great importance in the prevention of frost damage to plants by the creation of artificial heat.

Prevention of Frost Injury.

Various methods have been advanced from time to time as a means of preventing frost injury. The old method which is now considered to be more or less obsolete was the causation of dense clouds of smoke

* In a radio broadcast from National Station 4QG, Brisbane, and 4RK, Rockhampton, compiled from available information on the subject.

overlying the area to be protected. This method was known as smudg.-ing. The modern method is to heat the cool stratum of air immediately overlying the orchard, so that the temperature does not fall below 32 deg. Fahrenheit, the point at which frosts occur and cause damage.

With regard to the importance of the so-called atmospheric ceiling, it will be readily understood that if this ceiling did not exist and the air got colder from the ground upwards as soon as the lower stratum of air was heated it would rise to unlimited heights, and cold air would continually rush in to take its place. With the existence, however, of a body of air above the ground in which the temperature increases up to a height of several hundred feet the rise of the heated air is checked when it reaches a height at which the air temperature is equal to its own.

Supposing, then, that the temperature at ground level was 32 deg., and it was desired to raise the temperature by two or three degrees, it would probably be necessary only to heat a volume of air a few feet high.

For the purpose of creating heat various fuels have been used, such as wood, coal, coke, kerosene, crude oil, &c. Of these methods crude oil burned in specially constructed heaters is probably the most efficient. Among the advantages is that in suitable burners many fires can be set going in a short space of time, and in this connection it should be borne in mind that many small fires provide a better protection than a few big ones.

When there is a danger of frosts occurring several nights in succession the expense and labour are, of course, increased. In localities where wood is plentiful it is often used, and this is the method most used in Queensland up to the present time. The disadvantages of using wood, however, are the labour involved in obtaining it, as a number of fires are required per acre of orchard; the time occupied in lighting the fires, especially if the wood is wet or damp—and time is an important factor when the alarm bell indicates that there is danger of frost and the fires must be got going as quickly as possible.

Coal and coke have been used, but the great drawback here, also, is the time occupied in lighting, as kindling has to be used.

Oil fuel is easy to handle, easy to light, and easy to maintain at an even temperature. If the temperature is raised unnecessarily high, as indicated by the thermometer, some of the burners can be easily extinguished.

Types of Heater Used.

In Australia two types of heaters have been used with satisfactory results. The coke, coal briquettes, or charcoal heaters, which are simple and cheaply constructed of heavy guage iron, consisting of two parts, the cylinder with grate which contains the fuel, and the top which fits on the cylinder, comprising a draught cone, stack, and damper. Each heater is capable of holding approximately 20 lb. of fuel, which burns from four to five hours at a cost of 4½d. to 5d. per heater, varying according to the cost per ton. From 45 to 50 heaters of this type are required per acre.

Bucket heaters of all kinds burning low-grade oils have been used with unqualified success. Useful burners may be made from 2-gallon oil or paint drums, usually obtainable from hardware dealers. Dampers, which may be circular or triangular, should be made to fit over the tops of the burners, so that burning may not be excessive, the wick, which

can be made from any old rag or cloth, may be hung on the damper. Lids should be provided so that the heaters can be extinguished at will. Lighting is accomplished by the use of torches which drip burning fuel into the heaters. Such torch consists of a container with a spout and a wick so placed that the fuel will fall fairly freely, the lighted wick igniting the torch fuel as it flows out.

When Fruit Trees are Most Susceptible to Frost Damage.

The Commonwealth Meteorological Bureau will supply data showing the degree of cold which will probably be endured by different fruits up to thirty minutes.

The most susceptible period for frost damage is usually after the petals have fallen and the fruit is set. Should temperatures lower than 30 deg. Fahrenheit be expected, frost protection measures should then be contemplated. The lowest temperatures usually occur between midnight and 5 a.m. Alarm thermometers are placed where they will register orchard temperatures. The type generally recommended has been the "U" tube maximum and minimum thermometer connected with an electric bell system so arranged that an electric current passes through the mercury column, completing the circuit, and thus ringing the bell. This type does not always prove reliable, and in order to be on the safe side a type of alarm ringing the bell when the circuit is broken should be used.

Complete success in orchard heating is not attainable without an adequate number of heaters of sufficient fuel capacity and proper accessory equipment. Equipment, itself, however, merely renders success possible, but does not assure it. The individual whose personal efficiency is high may save his crop with rather inferior equipment, while his neighbour with much better euipment may fail. The essential of success is sufficient heat at the proper time. To provide the necessary heat the grower must be fully prepared at all times during the period of possible danger and must understand how to handle the firing under his own conditions with the type of heaters at his disposal. An excellent precautionary practice is the lighting of a few heaters after they are in the field and supposedly ready for emergency use. It is advisable to burn new heaters an hour or two as a means of getting them into condition to light readily when required.

The heaters should be placed so as to give a uniform distribution of heat. It is advisable to have a row of heaters, one to each tree, outside of the orchard on the side from which the air is drifting. The orchard heating problem consists, in part, of replacing the heat lost to the drifting air, but mainly in making up losses from radiation. As radiation occurs uniformly throughout the orchard, the ideal manner of lighting the heaters would be to leave no unlighted rows. It is better to have a heater to every other tree in every row than to place them one to a tree in alternate rows. Convenience and speed in lighting and ease in filling must, however, be taken into consideration in placing the heaters. Thermometers should be set up, torches filled and placed together, with a reserve supply of fuel in a convenient place.

APPLE STOCKS IN THE STANTHORPE DISTRICT.

By H. ST. JOHN PRATT, Instructor in Fruit Culture.

ABOUT the year 1924 it became apparent that the growing of apples was not a good commercial proposition in the Stanthorpe district. The cost of the land and its preparation for an apple orchard was out of all proportion to the returns received, and it was obvious that something was amiss. Some of the reasons were very apparent, chief amongst them being:—

(1) Many orchards had been planted in unsuitable land.

(2) The trees planted were of inferior quality.

(3) The trees had not been planted deep enough.

(4) The pruning adopted by many of the growers was quite unsuitable to the district.

(5) The growing of vegetables between the trees was grossly overdone, and at the trees' expense.

(6) The trees were allowed to bear at too early an age.

(7) No manuring with artificial fertilizers or green crops was being practised.

All of these reasons could be termed cultural and fairly easily remedied, and during the last decade to a large extent they have been inasmuch as—

(1) The speculative planting of orchards has ceased to be a paying proposition and growers have become careful as to the selection of an orchard site.

(2) The Department of Agriculture and Stock evolved grade standards for apples and other fruit trees, and no trees of inferior quality are allowed entry into Queensland from other States, or allowed to be sold by local nurserymen.

(3) The deeper planting of trees was shown to be more advantageous and now is generally practised.

(4) This has been remedied by Departmental instruction.

(5) Growers have ceased this practice to a great extent, realising the futility of it.

(6) Common sense has prevailed.

(7) Through a few growers demonstrating the value of the practice on the recommendation of the Department, it has become universal among the more progressive growers.

By 1929 the cultural methods had improved very considerably, and there were some very fine orchards in the district, but still it was apparent that the trees where they had had the very best of attention were in many cases disappointing, and could be improved on.

The Fruit Branch then directed its attention to the stock question—Was the Northern Spy, which was the stock almost universally used, the best for this district?

Mr. Ward, now chief Horticultural Officer of Victoria, had in 1923 or 1924 urged that seedling stocks should be tried out against Northern

Spy, and some growers had given them a trial with divergent results. In some cases where trees on seedling stocks had proved superior to the Spy stocks the growers were quite convinced that the problem was solved; in other cases, however, the seedling stocks they had procured were a failure, and seedling stocks were condemned.

Although the use of many of these seedling stocks had not solved the problem, and in many cases proved unsatisfactory, yet they showed that the stock problem was a real one, and left little doubt but that the Northern Spy could be improved on.

At that time some pomological experts in the other States were of the opinion that the solution of the problem was the use of seedling stocks; others, on the other hand, expressed themselves as being quite satisfied with the Northern Spy.

Then the Department's attention was drawn to the Empire Marketing Board's Research Station at East Malling, Kent, where they had been specialising in vegetative propagation. The claim of the vegetatively raised stock as against the seedling stock being that, once the required stock is evolved, it can be reproduced by vegetative propagation indefinitely without deterioration. The Doncin stock was an example, it being in general use in Europe in 1600 A.D.

Different stocks have been evolved and raised vegetatively at East Malling suitable for the various types of soil in different localities and varieties of apple. The ultimate size of the tree can be regulated, the age at which it will come into bearing, as well as other important factors such as the quality and size of the fruit, &c.

The seedling stocks, on the other hand, show great variation—which is only to be expected since each seed is a separate identity—in growth, time of coming into bearing, crops of fruit, rooting system, some being shallow rooting and others deep; and, last but not least, disease resistance.

The Department requested the Empire Marketing Board to forward a number of stocks that they considered worthy of a trial under Queensland conditions. The varieties received were Nos. I., II., IX., XII., XIII., and XVI. The arrival of these stocks in Queensland coincided with a visit from Mr. R. G. Hatton, Principal of East Malling Research Station, who was on a tour of the apple-growing globe. On Mr. Hatton being advised as to the stocks his station had sent, he expressed the view that probably we would find one or more stocks from these varieties suitable to our local conditions, his brief visit and ignorance of local conditions precluding him from being dogmatic as to which would prove the most suitable.

These East Malling stocks were, in February, 1930, planted out in an experimental plot where a trial of Granny Smiths, Delicious, and Jonathans on seedling stock *v.* the same varieties on Northern Spy had already been commenced.

In 1932 a number of stocks were worked over with Granny Smith and Jonathan varieties and the balance turned into stool beds—the method adopted for the propagation of further stocks of each variety.

In 1933 a number of the worked stocks were planted out and now have been in their permanent location close on two years.

As previously stated, the East Malling root stocks received were Nos. I., II., IX., XII., XIII., and XVI. They should be classified as follows:—

No. IX.	Very dwarf.
No. II.	Semi-dwarf.
No. I.	Vigorous.
No. XIII.	Vigorous.
No. XII.	Very vigorous.
No. XVI.	Very vigorous, and more so than XII.

This classification is under English soil and climatic conditions.

Under Queensland conditions it will probably be found that each variety will have to come down one in its classification. Very dwarf, No. IX., being only suitable for close planting in the kitchen garden. Vigorous, No. I., becoming semi-dwarf. Vigorous, No. XIII., becoming semi-dwarf. Very vigorous, Nos. XII. and XVI., becoming vigorous.

Apple trees on the various stocks having been planted out for close on two years, the following points have been noted:—

No. XII. is a very vigorous grower, having put on from 6 to 7 feet of growth between grafting the stock in October and the following May, and an average of from 6 feet 3 inches to 6 feet this, the following season. It has also a very desirable root-system with excellent anchorage.

No. XIII. also appears to be a very vigorous grower, having put on 5 feet 8 inches of growth the second season.

No. XVI. is proving, so far, slower than either XII. or XIII.

No. IX. is very small and unsuitable for Queensland.

Since the Stanthorpe problem apparently is that the trees are too small and not vigorous enough, and so they cannot carry a big enough crop—and since Nos. XII., XIII., and XVI. are vigorous stocks—then it might appear that all that has to be done is to work the trees in future on either of these stocks and the problem is solved.

If that were so it would be quite an easy matter, but there is a lot of other work to be carried out also. Some of the further work to be done with the East Malling stocks is to find out which stock is the best for each of our standard varieties—our best varieties are not grown to any extent in England nor theirs here, and if they were, what would apply thereunder their conditions would not necessarily apply here in Queensland. As an instance, at East Malling, No. II. stock proved dwarfing for one variety, vigorous for another, and very vigorous for a third.

Also the colour and quality of the fruit has to be taken into consideration, for, we know that in England the fruit from the very dwarfing No. IX. is larger and superior in colour and quality than the other stocks, whereas with the very vigorous No. XVI. there is a tendency to small fruit of a poor colour. Further reasons why we must not be too hasty in forming an opinion as to the best stock to use are that No. XIII. makes a very vigorous start but afterwards slows down somewhat and Nos. XVI. and I. start away rather slowly—certainly more slowly than XIII.—but become more vigorous as time goes on.

One decided advantage with the East Malling stocks is that they are very easy to propagate.

Although seedling stocks are liable to a good deal of variation, yet there are great possibilities in the vegetative propagation of stocks from seedlings of outstanding merit as regards root systems, growth, crop-production, quality of the fruit, and resistance to disease. By this means stocks can be reproduced with the parent stock's characteristics. With this end in view, especially good seedlings from the district, generally old trees that have outlived their mates and still are bearing good crops, are being propagated vegetatively.

We may find two or three even better suited to our local conditions than the East Malling stocks, and although we may be unsuccessful yet it is well worth trying, for no stock is a perfect one, and the best to-day may be only second best in the very near future.

In 1932 the Committee of Direction decided that they too would engage in research work in conjunction with the Commonwealth Bureau of Scientific and Industrial Research, and they have an officer working in the district.

The Department of Agriculture has rendered considerable assistance by supplying this officer with a large number of their East Malling stocks and also promising ones of local origin.

PLATE 21.—AN ORCHARDIST'S HOME AT BUDERIM MOUNTAIN.

Buderim is a rich fruitgrowing and dairying region about 60 miles north of Brisbane. Within the lifetime of a single generation of Queenslanders, the district has emerged from the primitive to the practical—from pathless jungle and rain forest to productive citrus and banana groves, coffee and ginger plantations, and pineapple gardens in cultivated orderliness.

CODLING MOTH.

The Australian Agricultural Council has received the following report from the Standing Committee on Agriculture dealing with codling moth.

Entomological Situation.

FOR many years the codling moth has been controlled effectively by the application of repeated lead arsenate sprays throughout the season. Many minor methods, such as the trapping of larvæ in bandages, the destruction of fallen fruit, and thorough sanitation of packing sheds and stores, have also been used, but generally merely to supplement the arsenate sprays.

Although effective and economically practicable, spraying with lead arsenate is both costly and very laborious, so efforts have been made for the past thirty years or so to find a substitute which is cheaper and easier to use. Moreover, lead arsenate sprays have not been completely effective under all circumstances. Individual workers have reported various sprays to be more satisfactory, but the general opinion is that lead arsenate is still the most satisfactory spray from the entomological point of view.

Public Health.

In recent years much attention has been paid to the lead and arsenic residues left on sprayed fruit. Following the example of Great Britain, a number of countries have made laws prohibiting the sale of fruit carrying more than a trace of arsenic. In Great Britain the maximum permissible quantity of arsenic is the equivalent of 0·01 grains of arsenic trioxide per pound of fruit. This makes ordinary spraying with lead arsenate practically impossible.

Amongst the earliest substitutes for arsenicals to be used were various fluorine compounds. In the United States of America, at least, the fluorine compounds are now looked upon with almost as much disfavour as the arsenicals, and the sale of fruit with more than a trace of fluorine is forbidden.

Research.

Efforts to devise methods of controlling the codling moth without the use of sprays are being continued, but it is generally felt that sprays give the greatest promise of success. The main work on codling moth control throughout the world can be divided under two headings; (i.) efforts to find satisfactory substitutes for arsenicals to be used as sprays, and (ii.) efforts to devise satisfactory methods of removing the arsenical residues from picked fruit.

Leaving fluorine compounds out of account, the most promising substitute for arsenical sprays are oil emulsions (particularly "white oils") and nicotine, which are often used in combination. In many of the experiments the substitutes are used only for the late sprays, lead arsenate being used in the earlier part of the season. A large number of other kinds of insecticides are, however, being tried out.

Appointment of Committee.

In all the Australian States some experimental work on the control of codling moth is being carried out. For the most part, this consists of trying out insecticides which have been developed elsewhere, and of adapting spray programmes to local conditions. The question of

co-ordinating and developing the investigations has been considered by the Standing Committee on Agriculture which decided that the Commonwealth Bureau of Scientific and Industrial Research should take action for the establishment of a representative committee to survey the whole position and make recommendations to the Standing Committee on the whole matter. This action is accordingly being taken.

PLATE 22.—BANANA PLANTATION, SOUTH QUEENSLAND.
This plantation and surrounding ridges were covered originally by dense jungle.

CITRUS INDUSTRY—MARKETING ORGANISATION.

THE Australian Agricultural Council at its meeting in Canberra last month carried the following resolutions concerning the citrus industry:—

The States are prepared to adopt uniform standards and to raise the standards progressively as knowledge justifies such action, providing no State is required to reduce its existing standards.

The committee is of the opinion that the production problems of the industry must be dealt with.

This committee is of opinion that an Australian citrus board should be established.

The committee is of opinion that the board should be constituted as recommended by the conference of the industry.

The committee is of opinion that the functions of the board should comprise export control, and advisory functions on similar lines to those contemplated for the reorganised Australian Dairy Produce Board; the

question of additional functions to be deferred pending the receipt of further recommendations from the sub-committee of the industry, which has been appointed to prepare the functions of the board.

The committee considers that, when the Australian citrus board exercises any authority in regard to the citrus fruit produced in any State, such State should have representation on the board.

This committee foresees very great difficulty in attempting to collect any excise duty by any means known to it, but feels that the matter should be deferred for further consideration.

For a considerable time past the problems of the citrus industry have been under consideration. Since the issue of a report by the development branch in 1930, attention has been given to the necessity for developing additional market outlets, improving the quality of oranges produced in Australia, and effecting a satisfactory organisation of the industry. Achievements to date leave much to be desired.

A severe blow was dealt to the industry when the New Zealand market was closed to Australian citrus fruit, with the exception of oranges from South Australia. The facts of this action are well known. Following upon the partial loss of the New Zealand market the Commonwealth Government instituted the system of guarantee of out-of-pocket marketing expenses, commencing with the 1933 export season. In 1935 the amount expended in this guarantee was approximately £3,000, while it is anticipated that the cost in respect of the 1934 export season will be £20,000. In addition, a grant of £10,000 was made available by the Commonwealth Government for the assistance of mandarin growers, and the New South Wales Government supplemented this grant to the extent of approximately £8,500.

In regard to future plantings it would appear desirable, in view of the nature of the industry's problems, that there should be some definite understanding. For example, States having oversea exportable surpluses at present might refrain from encouraging in any way the extension of plantings; while States not at present having oversea exportable surpluses might refrain from such encouragement as would lead to the production of an exportable surplus.

In addition to the above matters, it is considered that action should be taken:—

(*a*) To determine the orchards and/or areas which are producing fruit below a reasonable standard of quality;

(*b*) To ascertain the financial position of the growers concerned, including the nature and extent of their debts (this could be done in each State in connection with the Rural Debt Adjustment Plan);

(*c*) To formulate a satisfactory plan for dealing with the orchards and areas concerned. This might mean elimination of hopeless areas or reworking of trees where such a course would be economically justified.

The nature of the producers' debt position would have an important bearing on decisions as to whether or not it was worth while maintaining an individual in production, and it would be necessary to have this information in order that creditors might be negotiated with if the entire or partial destruction of an orchard were considered to be the only sound course economically.

Internal Marketing Problems.

These comprise organisation, and the enforcement of grade standards. The question of organisation is referred to below. On the other point, it is considered that grade standards for the domestic trade should be raised in some States, and that the standards should be made uniform in all States. If this action were taken and the standards were strictly enforced, the inefficient areas would quickly be disclosed.

The review and enforcement of the standards for domestic consumption is vital to any scheme for the rehabilitation of the industry. It is therefore desired that the States will indicate the steps they have taken or propose to take, on the above recommendation, as far as domestic standards are concerned. Discussion is also invited on the subjects of standards for packing, and the channels through which fruit can be sold.

Export Marketing Problems.

These also comprise organisation and grade standards, and in addition the question of inducement for export. As far as export standards are concerned, the problem is different from that concerning domestic standards, because of the necessity to ensure satisfactory preservation during transport. The Commonwealth Government has provided a sum of £2,000 per annum for five years to enable the Council for Scientific and Industrial Research to undertake investigations in the factors affecting the keeping quality of oranges during storage. As this work progresses it is hoped that it will be possible to amend and improve the existing export standards.

Organisation.

The problems of financial assistance for the industry and inducement for export are involved with the question of organisation. The recent conference of representatives of the citrus industry, in dealing with the plans for the reorganisation and stabilisation of the industry, decided that an all-Australian organisation should be formed, and a resolution in the following terms passed:—

> "That an Australian citrus association be formed, composed of four members from New South Wales, two each from South Australia and Victoria, and when Queensland and Western Australia desire to join there shall be one member from each of those States. The chairman of this proposed organisation shall be appointed by the Commonwealth Government.'

It was decided that a sub-committee should be set up to formulate details of the constitution and activities of the proposed board, so that the Government would be in a position to consider these details when dealing with the general recommendation of the conference. A sub-committee, consisting of General Heane, Mr. Moses (New South Wales), Mr. Schwennesen (Victoria), and Mr. Metters (South Australia), was appointed by the conference, and it has been arranged that this sub-committee will meet at an early date under the auspices of the Fruitgrowers' Federation of New South Wales. The report of the sub-committee will then be sent to the Commonwealth Government for consideration.

The functions of the organisation, which, if formed, might be termed the Australian citrus board, could include collaboration with the

Commonwealth and State Governments on all the problems of production and marketing referred to above. It must be emphasised that the mere establishment of such a board would not solve the problems of the industry. If we are to aim at orderly marketing, we must be prepared to eliminate low-grade fruit. If that is done, the establishment of a Federal organisation on the lines proposed should be a decided step forward.

This important and difficult matter was submitted for the Council's consideration. It was suggested that the various aspects might be considered in the following order:—

(1) Domestic marketing—Improvement and enforcement of grade standards; standards for packing; determination of channels through which fruit can be sold.

(2) Export standards—Commonwealth investigation (explanation for information of Council).

(3) Production problems—Future plantings; sale of nursery trees; determination of most suitable citrus stocks; plans for dealing with low standard orchards and areas.

(4 Organisation—Establishment of Australian citrus board; functions of the board (final determination to await further report from the industry sub-committee); finance for the board, and for the encouragement of export and rehabilitation of the industry.

PLATE 23.—PAPAW PLANTATION AT BUDERIM MOUNTAIN, N.C. LINE, QUEENSLAND.

TRANSPORT OF ORANGES.

FOR some years past the Council for Scientific and Industrial Research has been conducting investigations into problems connected with the preservation and transport of oranges. The investigations, which were under the control of a Citrus Preservation Committee, were of a restricted nature owing to the fact that only a small sum of money was available for the purpose. Nevertheless a great deal of valuable information has been accumulated regarding maturity at time of picking in relation to storage life, the handling and conditions of storage of oranges, particularly Victorian oranges.

Experimental Work.

Consequent on the approval given by the Commonwealth Government for a grant of £2,000 per annum for five years for citrus preservation work, action was taken by the Council of Scientific and Industrial Research, in consultation with the States concerned, to prepare a programme of work for extending the investigations of the Citrus Preservation Committee. The programme provides for investigations to be conducted on uniform lines at three centres, namely, Newcastle, Melbourne, and Griffith. In Melbourne and Griffith experimental cold chambers are already available, in the former place by the courtesy of the Victorian Department of Agriculture at the Government Cool Stores, and in the latter by arrangement with the Griffith Producers' Co-operative Society. In Newcastle arrangements are being made for an experimental cold chamber to be equipped with temperature control apparatus which is necessary for the purpose of the experiments.

It has been agreed that all the work in connection with respiration tests (which give a measure of the "rate of living" of the fruit) shall be done in Melbourne. The influence of variable factors in the orchard on keeping qualities will be studied principally at the Council's Citricultural Research Station, Griffith, where special facilities are available for that purpose.

The importance of including fruit from both the Murray Valley and Adelaide Plains districts of South Australia has not been overlooked, but as cold storage facilities for experimental work are not available in Adelaide, it has been arranged that the fruit from these districts shall be brought to Melbourne for storage.

In order that results from experiments in the various centres shall be directly comparable, uniform methods have been agreed on with regard to the amount of fruit to be used for the experiments, dates of picking, temperature of storage methods of examination, and so on.

Keeping Qualities.

The programme includes a comprehensive scheme of investigation into the preservation, &c., of navel oranges. Investigations on the influence of orchard factors on keeping qualities will include such matters as (*a*) the influence of stock on keeping qualities, (*b*) the influence of strain on keeping qualities, (*c*) environmental factors such

as extent of irrigation, effect of different methods of cultivation, &c., and (*d*) maturity of fruit at time of picking.

Experiments will also comprise investigation into types of sweating, processing, and wrapping.

As regards common oranges, experiments will be carried out with three export varieties, namely, Joppa, Silletta, and Parramatta, which will be picked at each of three different stages of maturity, and will be stored at uniform temperatures.

Important aspects of the agreement which has been reached are (*a*) the consolidation which has been affected in the various phases of the work in the different centres, and (*b*) the close co-operation which has been established between the Council of Scientific and Industrial Research and the Departments of Agriculture in New South Wales, Victoria, and South Australia. The responsibilities of the Council, on the one hand, and the Departments of Agriculture in the three States on the other, have been clearly set out, and work is now in progress.

Advisory Technical Committee.

It has been decided that the investigation shall be under the general direction of an advisory technical committee consisting of representatives of the Council of Scientific and Industrial Research and the three Departments of Agriculture, and, moreover, that a general co-ordinating committee (which will meet only at infrequent intervals) shall be appointed mainly for the purpose of obtaining the help of growers and others concerned with the citrus industry, and to facilitate transport and other arrangements. This general committee will include representatives not only of the Council of Scientific and Industrial Research and of three State Departments of Agriculture, but also of the Federal Citrus Council, the Australian Citrus Export Association, the Overseas Shipping Representatives' Association, and of the Australian Railways.

Control of Fruit Fly.

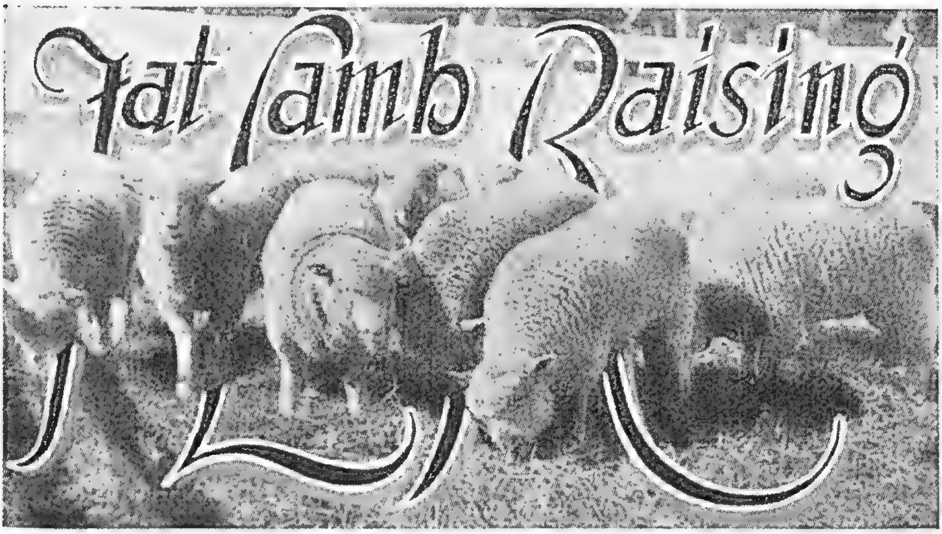
As a result of a resolution passed at a meeting of the Commonwealth Citrus Investigation Committee held in Melbourne in September, 1934, a proposal was put forward to the Prime Minister by the Premier of New South Wales to send an officer abroad with a view to obtaining parasites of the fruit fly and the white wax and white louse scales. The Premier of New South Wales pointed out that the officers of the entomological branch of the Department of Agriculture were of the opinion that in all probability fruit fly could be controlled by biological methods. Three species of parasites have been introduced from Hawaii, but so far they have not been recovered in the orchards. There are other parasites in India and West Africa. Although repeated attempts had been made to obtain these parasites from different countries, this had not so far been possible, and it was considered desirable that a trained entomologist should visit Ceylon, India, and West Africa in order to collect parasites and forward them to Australia.

The Fruitgrowers' Federation of New South Wales strongly supported the proposal and has made a sum of £250 available towards the expenses. The New South Wales Department of Agriculture will

pay the salary of the officer, and the Premier of New South Wales asked the Prime Minister if the Commonwealth Government would contribute a sum of £450.

The proposal made by the Premier of New South Wales has been supported by the Standing Committee on Agriculture, and the Commonwealth Government has agreed to contribute the sum asked for. The officer has already left Australia.

PLATE 24.—BANANA PLANTATION AT BUDERIM MOUNTAIN, N.C. LINE, QUEENSLAND.



PROSPECTS OF SUCCESS WITH ENGLISH TYPE SHEEP IN QUEENSLAND.

J. L. HODGE, Instructor in Sheep and Wool.

IF proof were needed the results of experiments in fat lamb raising conducted by Officers of this Department go far to show that, generally speaking, the farmers of the State have been neglecting an avenue of profit. When it is stated that 98 per cent. of the sheep in Queensland are of the merino breed it shows to what extent Queensland has lagged behind other States in this highly profitable undertaking. There is no doubt that a great proportion of our farming areas is suitable for the production of export lambs, and it behoves our farmers to give more attention to this branch of the sheep industry with the object of attaining a fair share of the export profits from Australia.

The portion of the State most suitable for the growing of fat lambs from English type sheep is to be found on the Darling downs and those areas adjacent, but there is no reason why graziers further afield should not engage in the industry with profit to themselves, providing they cultivate. Cultivation must be regarded as a prime necessity everywhere where fat lambs are the object. This is not to say that a crop of fat lambs may not be raised on natural grasses, but to do so is more or less in the nature of a fluke and the practice is not to be encouraged.

The relatively high price of farm lands, too, obtaining in the districts mentioned makes it incumbent on the farmer to cultivate if adequate returns on principal outlay are to be received.

Taken all round nothing is better than lucerne in this regard, and it is wonderful the country on which it will grow if care is taken to work a seed-bed of fine tilth. All the cereals make first-class feeding crops for ewes and lambs, and there is, of course, a chance that a crop may be harvested after the feeding-off process. Adequate provision should also be made for winter feeding, as the fat lamb must receive no check from birth to slaughter.

In past years the high price ruling for merino wool has proved a deterrent to the fat lamb business inasmuch as farmers were induced to dispose of valuable crossbred ewes. This policy has proved wrong, and now one of the difficulties with which this branch of sheep husbandry has to contend is the difficulty in getting the right type of crossbred

PLATE 25.—SHROPSHIRE RAM.

ewe to form the breeding flock. The ideal ewe for the purpose is got by crossing one of the long wools, such as Lincoln, Romney Marsh, or Border Leicester, with the big framed strong woolled robust type of merino ewe. The purebred Corriedale ewe of strong type is, too, another excellent ewe for the purpose. Here I would like to mention that the majority of those farmers breeding Corriedales are tending to get their flocks too fine in the wool for this breed of sheep, with consequent lack of size and constitution.

In the matter of suitable ewes for the fat lamb business, there is a profitable undertaking awaiting those graziers situated not too far from

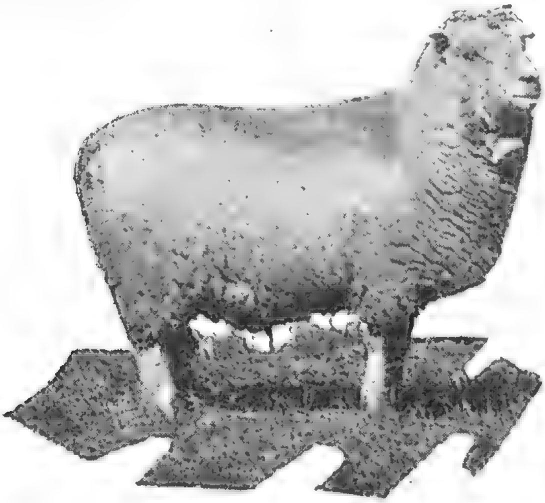


PLATE 26.—SOUTH DOWN RAM.

the Darling Downs if they would join long woolled rams of British breed with their cast for age ewes with the object of sending same in lamb to the Downs for sale. A ready market awaits ewes so mated, and, apart from profit, a useful purpose would be served and needed help given to the industry. Having reared or acquired the necessary crossbred ewe or Corriedale, it is recommended that one of the Downs type of ram be used. Of these the Southdown, the Dorset Horn, and the Shropshire have proved successful. The demand overseas is for a shapely early matured lamb free from leginess. When, as is often the case, merino ewes have to be used for the purposes of a breeding flock, the choice of rams may come from the Border Leicester, the South Down, the Dorset Horn, or the Romney Marsh. These four rams of British breed may also be used with advantage when purebred Corriedales form the breeding flock.

In districts where, on account of wet conditions, sheep would not ordinarily be depastured profitably, the Romney Marsh stands alone. Apart from other reasons this may be accounted for by his ability to withstand fluke and footrot.

A short description of some of the breeds mentioned may be of interest.

The South Down is a short junky sheep with mousy face and points, short on the leg, and very symmetrical. The wool from this breed is not to be recommended. The Border Leicester is a bold upstanding animal, beautifully square above the hocks and knees, with bare face and points. The wool crosses excellently with the merino.

The Dorset Horn is a large sheep carrying very masculine horns, placed well forward. He has very fine conformation and his lambs are early maturing. The wool is not of good quality. The Romney Marsh or Kent, as his name indicates, came from the marshes in Kent and it is probably, to this early environment, that we may trace his qualities in heavy rainfall areas. He is of bold symmetrical type, carrying himself well, has a black nose, and grows a lengthy type of wool, which crosses splendidly with our merino.

The Lincoln is a very large sheep, somewhat given to coarseness and carrying a coarse fleece of great length. He is of most value in Queensland when used on merino ewes to produce crossbreds suitable as mothers in the fat lamb industry. The Shropshire is a nicely built sheep with black face and points. He gets nice shapely lambs, but an objection to his use may arise if any of the progeny are left on the farm. His fleece is not a good one. The Corriedale, kept pure, is a good general utility farmer's sheep and the fleece is a profitable one.

It is extremely difficult to state a preference with regard to these British sheep and their crosses, but for general utility purposes, and taking the value of the fleece into consideration, it is thought that the farmer will not go far wrong if he uses the Border Leicester sire. Apart from the lamb produced, there is a distinct advantage to be gained if, as in the case of a bad season, the lambs are not fit for marketing. The Border Leicester cross sheep is profitable at any age.

This does not apply in the case of the South Down cross. The lamb from this cross must have the best of everything to fulfil all conditions appertaining to a fat lamb. Once checked he never picks up again, and if it is necessary to keep the lamb to a more mature age the resulting clip is not to be compared with the Border Leicester or the Romney Marsh cross. Undoubtedly at the present time the South

Down cross lamb makes the fashionable carcass, and if the farm is such that it will never let the owner down the South Down is to be recommended. The Dorset Horn cross matures quickly and well, but here again care must be taken to see that the whole drop is fit for

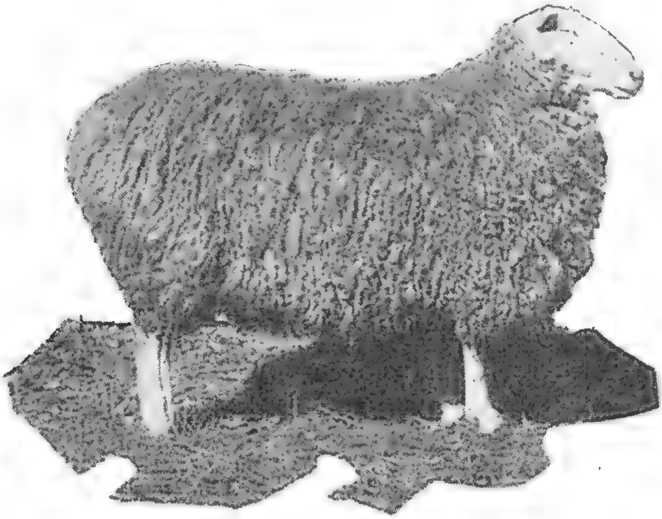


PLATE 27.—BORDER LEICESTER RAM.

slaughter within a given time. The choice of breed depends to a great extent upon local conditions. Experiments carried out by the Department of Agriculture and Stock during last year and in the early part of this year resulted as follows, as far as prices received for the lambs were concerned:—

No. of Sales.	No. of Lambs.	Total Value.	Prices.	Average.
		£ s. d.		
	BORDER LEICESTER CROSS.			
15	965	889 10 6	24/- to 12/3	18/5
	SOUTH DOWN CROSS.			
15	474	424 12 0	24/- to 11/-	17/11
	DORSET HORN CROSS.			
12	440	376 4 9	21/- to 13/-	17/1
	ROMNEY MARSH CROSS.			
2	18	14 14 3	17/3 to 14/-	16/4
	LINCOLN CROSS.			
6	182	134 17 9	17/6 to 12/-	14/9
	SHROPSHIRE CROSS.			
1	31	29 9 0	19/-	19/-

Total, 2,110 lambs of all breeds realised £1,869 8s. 3d. Average, all lambs per head 17s. 8d.

The Shropshire cross lambs were in only one sale, and that a good one, and therefore for comparative purposes the result should be discounted.

For the export trade it should be the object of growers to produce a lamb of 32 lb. prime fat and straight off the ewe at from four to five months. For local consumption the trade will take them heavier and pay in proportion.

There is no doubt whatever that Queensland farmers can produce the right type of lambs for export and, further, there is no doubt that there is no quicker money than that received for fat lambs in the sheep industry. From all points of view the farmers who will cultivate would be well advised to enter this most lucrative industry.

TRANSPORT OF PIGS IN CRATES.

The transport of single pigs in crates is a matter of considerable importance to both buyers and sellers of stud pigs. To ensure safe delivery the pigs must be loaded in strongly-constructed crates of the correct dimensions. If the pig is going on a very long journey and requires a feed or a drink en route, a trough must be provided at the head of the crate. Crates must be constructed so as to stand rough handling, and yet they must be light in weight to keep freight costs at a minimum. A door should be built in one end of the crate.

Well-constructed crates are fairly expensive, a crate suitable for a six-months-old pig costing about £1 1s. and one for a mature pig costing about £1 15s. If the cost of the crate were added to the price of the pig the total cost would often be prohibitive to the purchaser, so the usual arrangement is for vendors to quote the price for the pig and to loan the crate on the understanding that the purchaser will return the crate promptly and in good order with freight prepaid. Unfortunately, this arrangement is not always satisfactory to the vendor, for there are numerous cases in which the purchaser, apparently overlooking his obligation, fails to return the crate. Possibly he thinks it is only an old crate and hardly worth returning, but actually it is worth £1 or more, and he has received it on loan. Not only is it desirable to return the crate but it should be returned promptly, for a breeder has only a limited number of crates and if they are too long away from his farm he is considerably inconvenienced in the delivery of his orders.

Stud breeders complain frequently of crates being returned in a damaged condition, and it is common to see a crate with the front battered off to take the pig out when there was a perfectly good door at the back of the crate for the purpose.

Purchasers should also remember that unless they advise the vendor by letter as to date when the crate was loaded for return journey and advise probable date of arrival, vendors are put to considerable inconvenience in making unsuccessful inquiries at the railway station, thus losing time and money hunting for a crate that has probably not been returned. If these above matters were given a little more consideration—and after all they are really matters of ordinary decency—vendors and purchasers of stud pigs would be much happier.

Officers of the Department of Agriculture and Stock will gladly inform breeders on any of these matters and will supply details re preparation of suitable crates. It is also suggested that when pigs are being forwarded to shows for exhibition and sale, they should be transported in single crates, This expedites completion of arrangements for sale and is a very great advantage, as the return of crate can then be arranged for without inconvenience.

It is undesirable that vendors should refrain from supplying pedigrees until empty crates are returned, and this also leads to endless trouble. If the contract of purchase includes empty crates being returned, freight paid, then the purchaser should see to it that he fulfils his part of the contract just as the vendor does in supplying the pig. The purchaser should also remember that he merely has the loan of the crate to save expense of purchase, hence it is only fair that its early return should be attended to promptly.—E. J. SHELTON, Senior Instructor in Pig Raising.

Sheep Feeding.

By JAS. CAREW, Senior Instructor in Sheep and Wool.

SHEEP feeding is a problem presenting so many disadvantages and difficulties that a complete solution is not, under some conditions, economically possible. In certain circumstances, however, a solution is possible, but must be associated with favourable conditions, good management, and necessary reserves.

The necessity of a suitable ration is just as important for maintaining sheep as for other classes of live stock; in fact, more so, owing to the extra strain of growing and carrying their fleece. When the grass is green on our grazing country, sheep will do well on the natural pastures alone, and add to their store of physical reserves. These reserves will help them over periods of scarcity, or, if not too extended, during times when the pastures are dry. Feed during the winter months throughout the greater portion of the State, if not scarce, is usually dry and hard.

Seasonal Influences.

Where autumn and winter rains cause a growth of clover and herbage of different varieties, the mixture provides a well-balanced food supply suitable for fattening and for the requirements of breeding ewes and growing lambs, but, unfortunately for Queensland, our most useful rainfall occurs usually during the summer months.

In areas where frosts are prevalent, and which do not respond to winter rains, a great disadvantage is suffered, for the frosts dry the grass to such an extent as to leave it deficient in protein and minerals, as well as rendering it difficult to digest. The digestibility of foods is far more important in many instances than their actual nutritive value indicates, and for that reason plenty of good water adds to the value of a deficient pasture.

There are times when grasses and other growths are scarce and not sufficient to keep the sheep going, in which case the existing food must be supplemented.

Each locality, or even holding, has its own peculiar set of circumstances, and the feeding method must be in keeping with what food is available.

Segregate the Weak from the Strong.

Usually, as dry weather conditions continue some sheep will hold their condition better than others, resulting in a proportion becoming weak while others remain strong and well able to battle on. A big advantage will be secured in drafting off the weak sheep for special attention, for it is among these that the losses will occur if allowed to remain with the flock. By segregation the stronger sheep will be given a better chance without expense to the owner, at least for the time being. There will be, in the circumstances, little or no choice of paddocks; to save the weak sheep feeding will therefore be necessary.

To do this economically it is best to confine them to a convenient area sufficiently small that they have no inclination, after the first day or two, to search for food other than that given to them. The enclosure suitable should be not more than 20 acres for 1,000 sheep, and provided with suitable feeding facilities according to the method to be adopted, and a supply of good water with easy access. For a bulk ration, lucerne

hay at the rate of about 2 lb. per head per day, is about the best and most suitable, as it can be fed on the ground if there is no rack ready for the purpose. It should be of good quality, otherwise a considerable waste will occur. Other kinds of hay are, of course, also very useful. When sheep are fed on hay or when there is rough grass of low feeding value available, the sheep will require a protein-rich concentrate, and this is most conveniently fed in the form of cubes or nuts. Whole maize is also an advantage, being rich in carbohydrates, but should not be fed with the nuts. When feeding with a mixture that is easily taken up by the sheep, some of them will take all one type and others the other type, with the result that very few of them get the balanced concentrated ration. By feeding cubes and whole maize on alternate days, all the sheep will soon take to either variety when hungry. If fed on a suitable feeding ground (a clay pan preferably) the sheep can pick up whole maize or cubes very quickly; therefore they should be spread in circles or deep wavy lines to give all sheep an equal chance of getting their share.

The Importance of Licks.

In addition to this food a good lick should be supplied, as dry grass is sure to be deficient in minerals. The chief mineral requirements are salt, lime, and phosphoric acid; therefore, any lick containing these ingredients in the correct proportion will be an advantage.

The quantity of salt or other mineral contained in the drinking water is an important factor when compounding a lick. The more salt in the water the less is necessary in a lick, even to eliminating it entirely, in which case meals can be added in order to induce the sheep to take their requirements of lime and phosphoric acid. Both of these ingredients are present in finely ground Nauru phosphate in fairly even quantities; and also in bone meal, which should be sterilized before being used in a stock lick. Bone meal also contains a proportion of protein, which gives it an added advantage. No lick, however, should be expected to take the place of a food, but it is reasonable to expect it to give an added advantage to the food available. In supplying the mineral deficiency the lick will help to tone up the system, improve the digestive organs, create a better appetite, and cause a greater amount of food to be consumed and put to better use.

The chief minerals must be supplied in fairly well-balanced quantities, otherwise a craving will still continue. The idea of salt or salt and lime supplying the deficiency and fully satisfying the craving is not correct, for phosphoric acid is just as important as other minerals under varying sets of circumstances. As phosphoric acid is one of the chief elements deficient in our grasses when dry, and in shrubs and trees as proved by analysis, its inclusion in a lick is important and it is the most economic way to supply it. In South African experiments it proved valuable in increasing the supply of milk and caused an increased amount of roughage to be consumed. When sheep are on dry grass or when feeding on scrub, a good lick should consist of the following:—

30 lb. coarse crude salt free from large lumps.
25 lb. finely ground Nauru phosphate.
25 lb. Calphos or sterilised bone meal.
10 lb. Wheat, maize, or decorticated cotton-seed meal.
5 lb. Protein meal.
5 lb. Epsom salts.

After mixing thoroughly it should be moistened with molasses.

Many stock licks are manufactured in Queensland, all of which must be registered for sale here, and have the active ingredients stated on a label attached to the container. If an owner is acquainted with the analysis of water the sheep are drinking from and the feeding value of the pasture, he should be able to form a fair idea of the suitability or otherwise of a lick.

When salt (sodium chloride) is needed not more than 50 per cent. is necessary, while the phosphoric acid (P_2O_5) should show at from 10 to 15 per cent., and the lime (CaO) at a little less, both of which can be supplied in the form of bone meals or phosphates.

Trough Feeding.

Should trough feeding be the method adopted, it will be necessary to provide sufficient space according to size and type of sheep.

Rams will require from 18 to 20 inches, ewes about 7 inches, and lambs a little less.

All materials for trough feeding should be mixed and placed in the troughs before the sheep are allowed in. As most of the ingredients will be easily taken, they will require to have a safe controlling material included in the mixture, for which finely ground Nauru phosphate can be used to advantage. Bulk food in the form of lucerne chaff concentrates and minerals can be supplied in the one mixture which can be as follows:—

Lucerne chaff	33 lb.
Maize or wheat-meal	66 lb.
Decorticated cotton-seed meal	33 lb.
Bran	33 lb.
Protein meal	33 lb.
Finely ground Nauru phosphate ..	66 lb.
Salt	8 lb.

This class of feeding is intended to be given at a regular hour each day in order that the sheep get a fair foundation, allowing only a few ounces per sheep at the first feeding, with a little Nauru phosphate. When the sheep are taking to it freely, increase the ration and the Nauru phosphate until they get 8 oz. per day, and the full quantity of Nauru phosphate which can, if necessary, be increased to control the feeding. After having their ration they will usually have a drink and wander over the paddock until the next ration is due.

There are several concentrated products on the Queensland market which are manufactured for convenience in feeding in the form of nuts, cubes, and cubettes, all of which come under the Queensland Stock Foods Act, which requires to have the principal ingredients stated and shown on a label attached to the container.

Hereditary Unsoundness of Horses.

By A. F. S. OHMAN, M.V.Sc., Government Veterinary Officer, Toowoomba.

WITH the approach of the National Exhibition and the interest shown in horses to be exhibited there and at country centres, it has been thought of value to discuss this subject briefly. Furthermore, during the visits of the Government Stallion Boards to the various centres, it has been evident that most owners are ignorant of what constitutes hereditary unsoundness. This article may, therefore, prove of some value to them, and to stockowners generally.

Undoubtedly in farming districts the equine population is in the ascendant, possibly brought about by the fact that the cost of mechanical power has proved itself almost prohibitive to the small farmer.

In the case of the horse, the feed problem resolves itself into a domestic one, in so far that the necessary fodder can be produced on the farm and a reserve amount held in store.

The possession of a good stallion assures the perpetuation of the team. The acquisition of only a few foals annually suffices to provide the material with which to build up the team which may have been depleted by natural losses or by accident.

Unsoundness may be defined as "The existence of disease or alteration of structure which does or will impair the horse's natural usefulness."

For the purposes of this article it is proposed to deal with the following defects which constitute hereditary unsoundness:—Sidebone, ringbone, bone spavin, bog spavin, curb, thoroughpin, roaring, cataract, stringhalt, and osteo-porosis (bone disease or nasal disease).

Sidebone.

The examination of the extremity of the leg of the horse will disclose the pedal bone which is enveloped in the hoof. Attached to each side of it is a wing of cartilage which is of a flexible nature and capable of expansion. Nature has provided it as a means of allaying excessive jarring of the limb, which in the case of a heavy draught horse is considerable. It is situated at the back and sides of the extremity of the limb and above the heels. Under normal conditions of development the cartilage can be manipulated easily, and it is found to be elastic either when the limb is resting on the ground or when the foot is lifted.

The term "sidebone" is applied to the condition prevailing when the flexible side cartilage ossifies—i.e., when it shows signs of developing into bone. The extent of the ossification may vary within fairly wide limits, and can show as just a small pea-like enlargement or a complete ossification where the part becomes rigid and firm totally preventing any expansion at the heels. Occasionally the cartilage becomes replaced by bone in light horses, but the condition is usually encountered in heavy draught horses.

The cartilages most commonly affected are those of the fore limbs. Occasionally the cartilages of the hind limb are affected. Animals regarded as being most predisposed to the condition are those with short shoulders, thick heels, upright blocky feet, short pasterns, and narrow heels.

Upright blocky feet and short pasterns are particularly prone to the condition. Wide heels give great elasticity, and lengthy shapely pasterns provide some of the flexibility so necessary when horses are continually in action on hard metal roads.

Lameness may occur as the result of sidebone, but under suitable conditions an animal may work for many years although possessed of an ossified side cartilage. By utilising the animal in soft ground the working life may be considerably lengthened.

Ringbone.

To this condition the term "buttress foot" is frequently applied, and it can be encountered in both fore or hind feet. It consists of an exostosis or outgrowth of bone in the vicinity of the coronet and upwards towards the fetlock joint. At a point in the proximity of the fetlock it is termed "high ringbone."

Ringbone may be insidious in its onset. A definite lameness may be shown, but it is not characteristic. Gentle manipulation of the part may evince pain in the early stages.

As the condition advances local changes occur leading to a marked alteration in the conformation of the part and leaving no doubt as to the nature of the affection. The skin at the coronet becomes very much thickened, and a slight hard swelling may appear which gradually enlarges, and in time the whole pastern joint may be encircled with a ring of bony outgrowth. Animals with small blocky feet and short pasterns are more prone to the condition.

Bone Spavin.

This is the term applied to the enlargement so often encountered on the inferior third or the antero-medial portion of the hock—i.e., on the inner surface of the hock and directed somewhat slightly to the front.

It can best be defined as an exostosis or throwing out of bone on the inner or lower part of the hock arising from inflammation of one of the small bones of the hock joint and terminating generally in an anchylosis or a stiffening of one or more of the gliding joints of the hock.

Bone spavin is said to be found most frequently in animals in which the pelvis is broad, and in consequence of which there is greater slope of the leg above the hock.

Animals with sickle or cow hocks are very susceptible. In animals with broad hocks the bones present a much greater articular area over which the concussion received at the joint is distributed.

The affection usually runs an insidious course. At first in many cases lameness is not very apparent, and what is noticed is that the hock is not flexed with the former freedom. Later there is a marked stiffness in the joint, and still later a pronounced lameness, particularly when the animal is first brought from the stable. After exercise the lameness may disappear.

Incomplete extension of the joints below the hock leads to pressure being placed almost entirely on the toe, so the toe of the shoe becomes worn. As a later result of inaction of the heel we find the foot becomes upright and blocky, and the frog atrophies or wastes and is carried up and out of function.

When the animal is turned sharply towards the sound side there is obviously greater pressure thrown upon the inner aspect of the affected limb, and this tends to accentuate the lameness on account of the pain to which the animal is subjected.

Hunters are often susceptible to bone spavin, through the great strain imposed on their hock joints when jumping.

Bog Spavin.

This is the term applied to the condition in which the synovial membrane of the hock becomes unduly extended. An inflammatory condition may occur in the capsule of the joint with an abnormal secretion of synovia or joint oil. As the synovia accumulates the membrane forms a bulging and it is visible on the front and internal aspect of the hock joint.

Usually it is a dropsical condition and the swelling is cold and fluctuating. On palpation pain is not evinced and lameness is rare. the only cases being those in which the distention is so large as to interfere mechanically with the action of the hock.

Curb.

This is a sprain or injury of the strong calcuneo-metatarsal ligament which joins the calcis or point of the hock to one of the metatarsal or small shin bones.

It appears as a convex swelling on the upper third of that portion of the hind leg between the fetlock and the hock.

Certain kinds of hocks are more predisposed to curb than others. "Sickle Hocks" or hocks "tied in below" are prone to this malformation.

The presence of curb is noted by examining the animal from the side, and a comparison of the hind leg will usually determine the condition. Further, the examiner should palpate the seat of curb by standing with his back to the horse's head and the palmar aspect of the forefinger run down the course of the ligament, the tip of the finger being directed downwards.

Thoroughpin.

This is the term applied to the distention of one of the joint sheaths which overlaps the posterior surface of the hock. It appears as a soft fluctuant enlargement which may be on both the inside and outside aspect of the limb.

The enlargement may assume enormous proportions and become exceedingly hard, especially while the limb is supporting weight. In cases thoroughpin produces an obstinate lameness.

Thoroughpin may coexist with bog spavin, but the two are never directly connected with each other. Each is a distension of a separate synovial sac.

Roaring.

This is a condition which is set up possibly as the result of the paralysis of the nerve which supplies the muscles of the larynx. In almost all cases it is found to be associated with the left side of that organ.

Many theories have been advanced respecting the cause of roaring, but the etiological factor is still a matter for conjecture. By some it

is said to be due to pressure on the nerve supplying the left side of the larynx and by others to a disease of the nerve.

There is some ground for the suggestion that pressure on the nerve is the cause of the condition when it is remembered that on the left side the larynx is ennervated by the recurrent laryngeal nerve which passes beneath a number of organs in close proximity to the gullet. On the right side the nerve supply is direct.

On either side of the larynx is a small ventricle or pouch which moves in conformity with the natural breathing process. When the nerve supply is impaired the muscles are affected and uncontrolled, and the small pouch is at liberty to flap about under the influence of inhaled air. Thus we find the pouch obstructing the intake of air and the accompanying whistling or roaring noise evinced. Under severe exercise the condition is aggravated and distress occurs.

Cataract.

This is an affection of the lens of the eye. It gradually asumes a greyish-blue appearance and finally a milky white colour. Slowly it becomes opaque with creeping blindness.

Often the onset is insidious, and to the casual observer the condition may for a long time go unnoticed. A shyness of certain objects, a constant pricking of the ears and undue lifting of the feet suggest oncoming blindness.

Stringhalt.

This is a symptom of an obscure lesion whose pathology is still a mystery. The closest observation on innumerable affected animals has given no clue to the location or the nature of the causative lesion. The theories of different veterinarians might be repeated *ad infinitum* without finding two of them similar, which fact clearly exemplifies the mysteriousness of the condition.

The condition is one wherein the hind legs are unduly flexed towards the belly in a somewhat accentuated spasmotic fashion, and perhaps kept flexed for some time and with difficulty replaced on the ground. The animal assumes a straddling gait behind and experiences extreme difficulty in moving backwards or pivoting quickly on the hindquarters.

Osteo-porosis (Bone Disease, Nasal Disease).

This is an hereditary disease of bone. It is chracterised usually by a shifting lameness commonly affecting the hind limbs, and unaccompanied by symptoms of local inflammation. At times it may be mistaken for rheumatism. Difficulty may be experienced in rising preceded by a marked leg weariness after work.

The head bones or more particularly the facial bones may show signs of swelling, and often this is considered one of the diagnostic symptoms. Swellings of the joints may occur. In cases of blood stock it is often found that spontaneous fractures occur during exercise or racing and it is in thoroughbred stock that osteo-porosis is most prevalent.

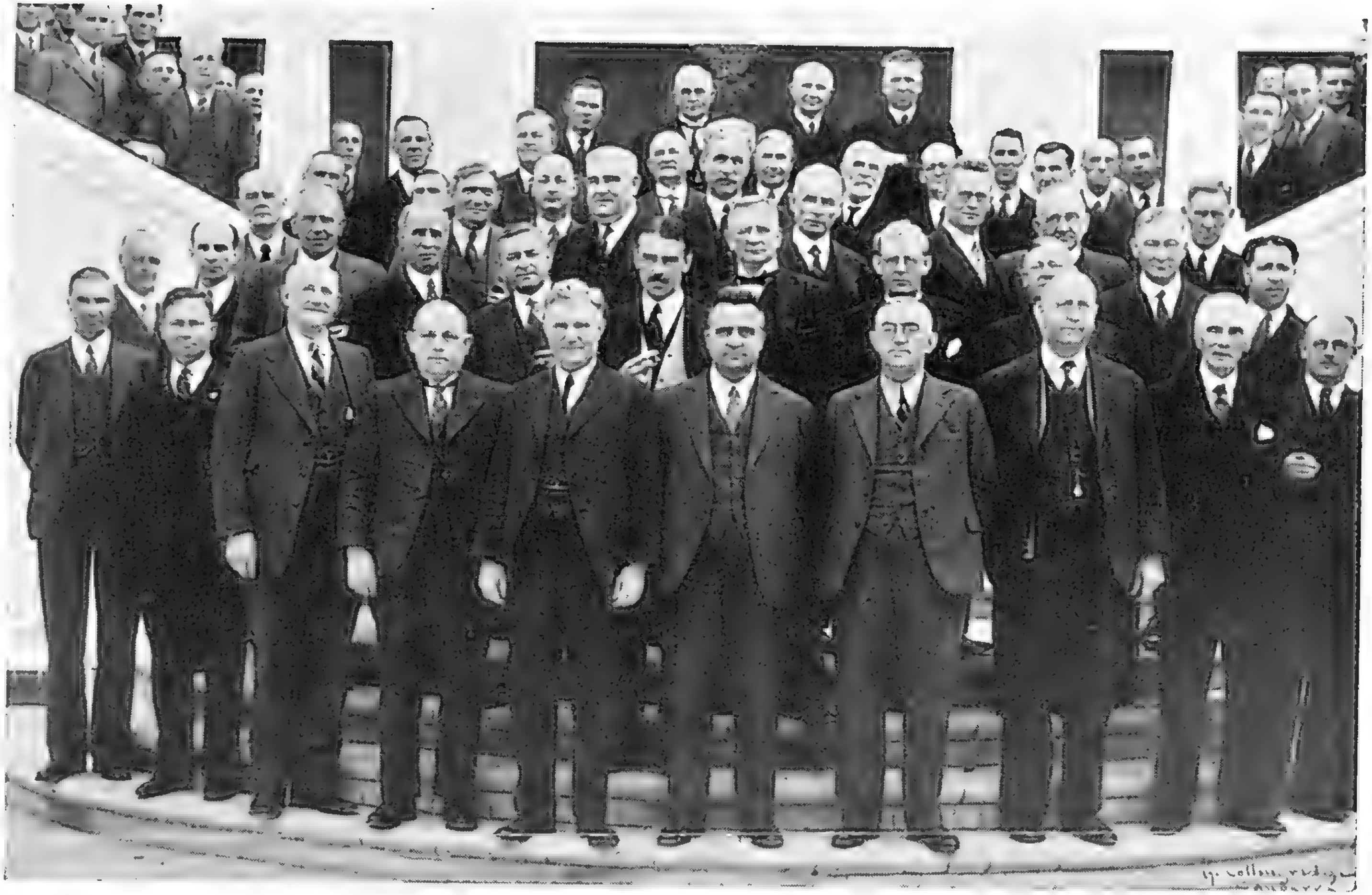


Photo.: B. Collingridge, Canberra.]

HISTORIC GATHERING AT CANBERRA.

Federal and State representatives at the Conference on Commonwealth Finance and the Conference of the Australian Agricultural Council, held at Canberra, 27th to 31st May, 1935.

Front row, reading left to right:—Hon. T. Paterson (Minister for the Interior), Mr. J. H. Stanley (Under Secretary, Treasury, Queensland), Hon. G. Ritchie (Deputy Premier, South Australia), Hon. A. A. Dunstan (Premier, Victoria), Right Hon. Earle Page (Acting Prime Minister), Hon. B. S. B. Stevens (Premier, New South Wales), Hon. W. Forgan Smith (Premier, Queensland), Hon. P. Collier (Premier, Western Australia), Hon. E. Dwyer Gray (Deputy Premier, Tasmania), Mr. H. A. Mullet (Director of Agriculture, Victoria).

Others in the group include (second row) Mr. R. Wilson (Department of Agriculture and Stock, Queensland), Sir David Rivett (Council for Scientific and Industrial Research), Right Hon. Sir George Pearce (Minister for External Affairs), Hon. E. S. Spooner (Assistant Treasurer, New South Wales), Hon. R. G. Casey (Commonwealth Treasurer), Hon. H. E. Manning (Attorney-General, New South Wales), Hon. Frank W. Bulcock (Minister for Agriculture, Queensland); (third row) Mr. G. Lightfoot (Council for Scientific and Industrial Research), Hon. Hugh Main (Minister for Agriculture, New South Wales), Mr. F. E. Ward (Director of Agriculture, Tasmania), Senator A. J. McLachlan (Postmaster-General and Minister in Charge of Developments and Scientific and Industrial Research), Hon. E. Hogan (Minister for Agriculture, Victoria), Hon. T. C. Brennan (Acting Commonwealth Attorney-General), Hon. Frank Wise (Minister for Agriculture, Western Australia), Mr. G. L. Sutton (Director of Agriculture, Western Australia); and other chief departmental officers of the Federal and State Services.

[*Face page 95.*

Australian Agricultural Council.

FIRST BUSINESS SESSION.

THE Australian Agricultural Council, which was formed in December last, held its first business session at Canberra during the week ending 4th June.

The Assembly, which included State Ministers of Agriculture and members of their advisory, scientific, and administrative staffs, was the most important in the history of Australian agriculture. Discussions covered a very wide range of subjects, and, as a result, many phases of production and marketing problems were clarified, and the way was cleared for closer co-operation of Commonwealth and State Departments in all major matters affecting the welfare of the primary producers of Australia.

A NEW OUTLOOK ON AGRICULTURE.

One of the most important results of the Session was the development of a new outlook on Australian agricultural and related problems. Consequently, a really national plan for the improvement of efficiency in production and regulation of marketing is in immediate prospect.

Every member of the Conference—representative as it was of the Commonwealth and State services as well as the Governments of the day—was actuated by a desire for concrete achievement. Apart from work actually done and immediate aims definitely achieved, a firm, broad basis for continuous progress in other matters of moment was laid.

SUMMARY OF DECISIONS.

Following is a summary of the chief decisions of the Council:—

Wheat.

Marketing.—"That this Council recommends that the present interpretation of Section 92 of the Constitution regarding marketing, quarantine, and transport be clarified and confirmed and that the matter be remitted to a Committee of Attorney-Generals of the Commonwealth and States for determination of the appropriate means whereby this should be done."

Wheat.—"This Council is of opinion that legislation for organised marketing of wheat should be introduced and passed by the Commonwealth Parliament and the Parliaments of three or more wheat-exporting States as was done regarding butter."

F.A.Q. Standard.—Agreement was reached that present method of determining f.a.q. standard for wheat is unsatisfactory, and recommendation by Mr. Sutton, Director of Agriculture, Western Australia, for an alternative method confirmed. The Council decided to defer action until reports have been received from the Standards Association and a New South Wales officer investigating the problems abroad.

Dairying.

Control Board.—The Council decided to alter the name of the Dairy Produce Export Control Board to "Australian Dairy Produce Board"; that the Australian Dairy Council be disbanded; that the powers of the

latter be transferred to the remodelled Board; that various export levies be consolidated; that the Board comprise one representative of proprietary butter factories, one representative of cheese manufacturers, four representatives of co-operative butter factories, six producers' representatives, and an independent chairman.

Butter Substitutes.—Legislation requiring margarine and margarine-like substances made in whole or part from imported oil to be marketed in white colour was recommended by the Council.

Quality of Butter.—Active steps determined upon to raise the quality of butter, especially by a system of administrative control in respect of cleanliness on farms, grading of cream, and technique and cleanliness in factories.

Uniform Export Brands.—Action decided upon to reduce the large number of brands. The question of a common brand to be referred to the new co-ordinated Board.

Other Industries.

Citrus Industry.—The States intimated their willingness to adopt uniform standards provided no State is required to reduce existing standards. An Australian Citrus Board to be established, its functions to be export control, advisory functions regarding quality and research, and others to be determined.

Potato Industry.—A Federal Potato Advisory Committee to be formed, comprising two representatives of each State. The Committee's functions to be to advise the Australian Agricultural Council on matters affecting the welfare of the industry, to disseminate propaganda regarding the need for organised marketing, to distribute crop and marketing information and statistics.

Apple Industry.—The States to investigate the relation between production and marketing and to report to the Australian Agricultural Council.

General.

Pedigree Stock.—The Council endorsed the principle of Governmental assistance to importers of pedigree stock to embrace Clydesdale and Suffolk Punch horses, beef and dairy breeds of cattle, mutton breeds of sheep, and Berkshire, Large White, Middle White, and Tamworth pigs. A scheme to be prepared in consultation with the Commonwealth Bank and Shipping Companies.

Wire Netting.—The Council agreed with the principle of advances to settlers for purchase of wire netting and the Department of Commerce was asked to draft a scheme.

Soil Drift.—The Commonwealth Bureau of Scientific and Industrial Research to appoint a special officer to investigate the problem.

Wild Pests.—All delegates agreed to raise the matter with their respective Governments with a view to combined action to fight the menace.

Food Preservation and Transport.—The Australian Agricultural Council adopted in principle a proposal that the Commonwealth Bureau of Scientific and Industrial Research Food Preservation Research Laboratories should be centralised in Sydney. The Commonwealth Bureau of Scientific and Industrial Research will discuss the matter further with the Queensland Government with a view to making satisfactory arrangements for retaining the work on chilled beef in Brisbane.

Alsatian Dogs.—The Council decided that action should be taken to exclude Alsatian dogs from areas where dingoes are known to exist.

Grasshoppers.—The Council accepted a recommendation that the Commonwealth Bureau of Scientific and Industrial Research be requested to undertake investigations into the habits and ecology of the plague grasshopper, particularly with a view to obtaining definite information regarding the breeding grounds and conditions which lead to plague conditions. The devising of methods of prevention and destruction are also contemplated.

Mycological Institute.—The Council decided that Australia should contribute £500 for 1935-36 to the Imperial Mycological Institute, whose duty is the identifying of plants, &c.

Reports Received.—The Council discussed numerous economic and scientific reports which related to tobacco, seed testing, codling moth, and other products.

CHEAP RUG FOR DAIRY COWS.

Where proper shelter is not provided for stock, not only is their resistance to disease reduced, but much food material is wasted in ''warming the wind,'' or in other words, meeting the increased demands of an exposed body.

This fact has an important application for dairy farmers. A cow's food is only devoted to production after the animal has satisfied its needs for nourishment and heat. In assisting the cow to conserve the lastmentioned, shelter belts in the form of trees and hedges have considerable utility on the dairy farm, especially in colder districts and situations, and for the same reason the rugging of the animals during, at any rate, a portion of the winter is well worth while.

Many farmers would like to rug their cows, but cannot afford to purchase the market article. The farmer can, however, make his own cow rugs for little more than the cost of two or three cornsacks or other heavy bags, a ball of twine, and a sewing needle, plus his own ingenuity. Two bags, or three for larger cows, will make an effective rug if utilised as follows:—

Split the bags down the seams and join together and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted; it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has worked into the rug, it will also be waterproof. The rug can quite easily be slipped off and on over the cow's head, and it is advisable to remove it daily except on rainy or very bleak days. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

A trial on one or two cows will prove the efficacy of these rugs, the animals soon showing their appreciation in a practical manner.—A & P. Notes, N.S.W. Dept., Agric.

Queensland Weeds.

By C. T. WHITE, Government Botanist.

INDIAN JUJUBE OR CHINA APPLE (Zizyphus mauritiana).

Description.—A large shrub or small tree, branches clothed with a dense velvety or thin felt-like clothing of hairs and numerous recurved prickles, a prickle usually subtending each leaf and flower cluster. Leaves ovate, elliptic or somewhat rounded, mostly about 2 inches long on a leaf-stalk or petiole of less than ½ inch; green above, whitish beneath with a felt-like covering of hairs, prominently 3-nerved from the base, the nerves very conspicuous on the under surface. Flowers in clusters in the leaf-axils, clusters ½ to ¾ inch across, individual flowers small, about 2 lines across, and borne on slender pedicels when fully opened, greenish white with a fœtid odour. Fruit yellow, about the size of a cherry, usually of rather a pleasant slightly acid flavour.

Distribution.—A native of Mauritius, India, and South-western China; introduced into many tropical countries.

Botanical Name.—*Zizyphus* from Zizouf, the Arabian name of one of the members of the genus; *mauritiana*, a native of Mauritius.

Common Names.—Usually simply called jujube, but the United States authorities, having in view the economic possibilities of the true Chinese Jujube (*Zizyphus jujuba*), preface the name Indian to it. In North Queensland it is mostly known as China Apple.

Uses.—Writing of this tree in U.S. Dept. of Agric. Bull. 1215, C. C. Thomas states:—"It has now been introduced into the East Indies, Australia, and the Mediterranean region. In Egypt it is called 'ennab.' On the island of Mauritius a large number of horticultural varieties have been evolved. The species tolerates even a warmer climate than does the Chinese jujube. The fruit is quite acid in flavour and should prove of value as a tart fruit in the warmer sections of Florida. It has been introduced by the Department of Agriculture into Southern Florida, where there are a number of trees in bearing. The fruits vary in quality, some of them being delicious, others developing butyric acid in the process of ripening. This species is a positive acquisition to Florida horticulture. It will prove a desirable fruit for dooryards because of its unfailing habit of fruiting."

Botanical Reference.—*Zizyphus mauritiana* Lam. Encyl. Meth. Bot. III., 319 (1789). Synomym *Z. jujuba* Lam. non Mill.

Acknowledgment.—My thanks are due to Mr. A. Rehder, Curator of the Arnold Arboretum, for verification of the nomenclature of the species of jujube naturalised in North Queensland.

PLATE 28.—INDIAN JUJUBE OR CHINA APPLE (*Zizyphus mauritiana*).

THE dry conditions prevailing in the pastoral areas are now extending to the coast. Apart from isolated falls, very little useful rain has been experienced since March. The central and southern coast benefited by falls of from $\frac{1}{2}$ to 2 inches late in May, but precipitation was lighter on the Downs—Dalby, Oakey, and Clifton being the only centres reporting over half an inch. Light falls from 8th to 10th June were of some benefit to winter crops.

Wheat.

The general sowing is delayed, although a large area has been prepared awaiting suitable conditions. Crops sown during May are looking well, having benefited by the showers, which were insufficient to enable sowing on soils lacking reserves of moisture. A dry season emphasises the value of fallowing to conserve moisture and permit of seasonal sowing, for the longer such sowing is delayed the lighter the prospective return. An occasional long fallow is also essential to clean up land infested with weed pests which are definitely on the increase throughout the older settled wheat districts.

Canary Seed.

The Queensland Canary Seed Board supplies graded seed of high quality, and growers would be well advised to be loyal to the organisation responsible for the present tariff rates which are based on the cost of production. The selling of badly-graded seed outside the pool at a price below the cost of production is merely assisting the opponents of organised marketing who benefit by the importation of seed. The Board endeavours to satisfy the demand in relation to both quality and quantity, and while urging that adequate supplies be produced, stresses the fact that undue over-production would result in the industry becoming unsound. However, recent investigations show that in order to meet increased consumption for the 1935-36 season at least an increased yield of $33\frac{1}{3}$ per cent. on the average of previous years is very desirable. As there has not been an excess production in Queensland to date, growers should make a liberal planting, as, in view of the tariff position, a small surplus is preferable to a shortage.

Although canary seed can be sown in May, when sufficient soil moisture is present, such sowing has been successfully carried out up to

the end of September during abnormal seasons. It is advisable to wait until a rapid germination can be assured, drilling in approximately 8 lb. of seed per acre so as to lightly cover the seed.

Tobacco.

Harvesting of the main tobacco crop was proceeded with during June throughout the northern areas. In the Mackay district seasonal conditions have been very favourable to growth and good yields are being secured, while the quality of the cured leaf is also satisfactory.

PLATE 29.—THE PINBARREN VALLEY ON THE NEAR NORTH COAST.

Increased interest is being taken in tobacco-growing in the south-west districts, and owing to the better attention given to the ripeners of the leaf during harvesting, combined with improved methods in curing, the price per pound received will be much better than in previous years. Many growers intend to apply fertilizers during the coming season.

The State's crop is now estimated to yield 1,400,000 lb., which considerably exceeds the previous season's yield, while the quality of the present crop is also superior.

Tobacco lands are still available for selection in the Mareeba, Dimbulah, Herberton, Cooktown, Bowen, and Townsville districts.

Growers are reminded that section 19 of the Tobacco Industry Protection Act provides for the compulsory removal of old tobacco plants within one month from date of harvesting. This is necessary to assist in the prevention of pests and diseases, especially in districts where early sowing is practised.

PLATE 30.—THE BURNETT RIVER AT BUNDABERG.

PLATE 31.—ON THE SHORE OF LAKE EACHAM, ATHERTON TABLELAND.

Markets.

Ruling rates for produce are in excess of those prevailing at a similar period of last year, particularly for hay and chaff owing to the increased demand from the western districts. The quality of some consignments reaching the West leaves much to be desired, while the freight to stations remote from the railways is practically prohibitive.

Maize is still selling at under 4s. per bushel owing to the heavy deliveries now being made from the late crop. Queensland potato-growers are now securing a greater share of the local market, and the excellent prices received indicate that this crop is among the most profitable to grow at present. Up to £10 10s. per ton was recently paid for Queensland-grown Carmens, while seed potatoes from across the border have realised over £13 per ton. Careful attention to cultural details, spraying, and the grading of the crop are factors in successful potato production.

Sugar.

Practically all cane areas were favoured by light rains early in June. These have served to assist the young plant cane which has, to date, germinated very satisfactorily. They will also assist in maintaining the grown crop in a satisfactory condition, although the low atmospheric temperatures which have been general throughout the North preclude vigorous growth. Doubtless, little further growth may be expected before September, and the mills are now in a position to gain a more accurate forecast of probable tonnages. Estimates have been reduced in only a few instances, while several mills have advanced their original forecast by a slight percentage. It is pleasing to report that no serious frosts have been experienced to date.

PLATE 32.—DOWN THE VALE.
A scene in the Fassifern District.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 2nd July, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for July, August, and September, 1935:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 2nd July, 1935—"Does Pig Raising Pay," by L. A. Downey, Instructor in Pig Raising.

Thursday, 4th July, 1935—"Potato Spraying Experiments," by R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 9th July, 1935—"Economic Factors in Pig Production," by E. J. Shelton, Senior Instructor in Pig Raising.

Thursday, 11th July, 1935—"Lemon Growing in Queensland," by R. L. Prest, Instructor in Fruit Culture.

Tuesday, 16th July, 1935—"Breeds that Pay," by P. Rumball, Poultry Expert.

Thursday, 18th July, 1935—"The Marketing Difficulties of Citrus, and How to Overcome Them," by J. H. Gregory, Instructor in Fruit Packing.

Tuesday, 23rd July, 1935—"Sheep Management and Feeding under Drought Conditions," by J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 25th July, 1935—"Hints on Handling Bees," by H. Hacker, F.R.E.S., Entomologist.

Tuesday, 30th July, 1935—"Further Remarks on Animal Nutrition," by E. H. Gurney, Agricultural Chemist.

Thursday, 1st August, 1935—"Banana Weevil Borer," by J. A. Weddell, Assistant Entomologist.

Tuesday, 6th August, 1935—"Care and Management of Growing Chickens—Part I." by J. J. McLachlan, Poultry Inspector.

Thursday, 8th August, 1935—"Care and Management of Growing Chickens—Part II.," by J. J. McLachlan, Poultry Inspector.

Tuesday, 13th August, 1935—"Selling Our Scenery," by J. F. F. Reid, Editor of Publications.

Thursday, 15th August, 1935—"When the Cows Come Home," by J. F. F. Reid, Editor of Publications.

Tuesday, 20th August, 1935—"Avocado Growing," by H. Barnes, Director of Fruit Growing.

Thursday, 22nd August, 1935—"Harvesting and Marketing Tomatoes," by J. H. Gregory, Instructor in Fruit Packing.

Tuesday, 27th August, 1935—"The Necessity for Culling and Its Advantages," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 29th August, 1935—"Bush Hay," by N. A. R. Pollock, Senior Instructor in Agriculture.

Tuesday, 3rd September, 1935—"Fungicides and Disease Control—Part I.," by J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 5th September, 1935—"Fungicides and Disease Control—Part II.," by J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 10th September, 1935—"Fungicides and Disease Control—Part III.," by J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 12th September, 1935—"Salt Bushes," by C. T. White, Government Botanist.

Tuesday, 17th September, 1935—"Chloris Grasses," by S. L. Everist, Assistant to Botanist.

Thursday, 19th September, 1935—"Manures and Fertilizers," by E. H. Gurney, Agricultural Chemist.

Tuesday, 24th September, 1935—"Brains in Farming," by J. F. F. Reid, Editor of Publications.

Thursday, 26th September, 1935—"Kilkivan to Kingaroy—An Epic of Pioneer Settlement," by J. F. F. Reid, Editor of Publications.

SCOUR IN YOUNG PIGS.

White or Yellowish Scour in poung pigs, often a very persistent type of dysentry or diarrhœa, is one of the most dangerous of diseases of newly born, suckling, or weaner pigs. It is a very common complaint and, as such, has a variety of causes, most of them probably being associated with the food supply.

In very young pigs the disease is usually brought on through some derangement in the food supply of the sow, her food may be too plentiful, too rich, or it may have been suddenly changed from one class to another. Too much food is just as harmful as too little. Food that is too watery, fibrous, or unpalatable may induce the trouble. A sudden change in the weather may be a cause; cold westerly winds, especially after heavy rain, are often disastrous. Pig shelters, sties, houses, may be cold and draughty; or they may be ill-ventilated, stuffy, and insanitary. Musty, mouldy, stale and sour foods, very hot or very cold soup with an excess of fat, buttermilk, skim milk or whey, adulterated with an excess of water, decaying vegetable matter—these are all common causes.

Two cases came under notice recently; a picture theatre required a two-weeks' old sucker to train for a special pantomime. A suitable sucker was obtained and special instructions were given to keep the little fellow on the "hungry side," following the food rule—little and often. The picture-show man thought the little fellow could do with a "good blow out," so he fed him up, and, of course, blew him out. This little pig did not go to market.

Another lady rang up to say she was bottle-feeding a piglet two-weeks old, but he had developed severe dysentry and was very sick. When the cause was explained she remarked, "Oh, goodness; thank you very much; I've been giving him half a cupful at a time." The cause was very evident.

In recent years, it has been demonstrated after careful research, that there is a form of diarrhœa in young pigs described technically as "nutritional anœmia," a trouble common where the winters are very long and cold and where the sows are housed indoors for long periods, and have not the benefit of sunshine, its violet rays, and so forth. In these cases the young pigs and anæmic, they are sickly, weakly, and have no stamina; and as the trouble is a nutritional one, unless it is instantly corrected, the loss may be very heavy.

There are scores of cases too where pigs kept under the very best of conditions in sunny climes suffer frequently because they are given too good a time and suffer digestive disorders which lead to bowel derangement. This disease is not usually of parasitic origin, except in weaners, slips, and stores, in which migrating parasites may have set up digestive troubles.

Lack of mineral matters in foods, otherwise of good quality and fed in proper quantities, is regarded as a common cause. One writer, T. G. Joyce, says "apparently the store of iron they possessed when they were born has been used up in making blood as they grow and a fresh or added supply is needed." It was this phase that induced investigations to attempt the feeding of iron and other necessary minerals through the sow, in the hope that the chemical content of her milk would be improved. It is evident, however, that if the milk of the sow is deficient in iron, she herself must be suffering, and probably the dosage given has been just sufficient to make up her own bodily requirements and the feeding of excess is unproductive.

Mr. Joyce tells us that the attempts made to apply iron solutions to the sow's udders, or anywhere the little pigs might lick, have not been altogether successful because the young pigs do not seem to like the bitter taste of the iron. It has been found that iron preparations containing traces of copper are more effective. It is recorded that the mixture of iron and copper drugs does not keep well, hence small quantities only should be prepared. In all cases, a preliminary treatment in which each pig suffering or in contact, is given one or two teaspoonfuls of castor oil is advised.—E. J. SHELTON, Senior Instructor in Pig Raising.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of May, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Greenfields Lorna	S. Henry, junr., Gympie	16,097·55	529·61	Darcy of Springdale
Rhodesview Queenie 8th	W. Gierke and Sons, Helidon	10,181·52	427·699	Birdwood of Blacklands
Happy Valley Ivydene	R. R. Radel, Coalstoun Lakes	10,268·9	426·905	Molly's Hero of Glenthorn
Hillvale Star (268 days)	Mrs. J. H. Weber, Peak Crossing	10,674·1	413·213	Drafter of Greyleigh
Aurora Dora II. (267 days)	L. T. McCauley, Mundubbera	9,241·25	371·194	Hugh's Prince of Blacklands
Waverley Model	R. Scott, Toogoolawah	16,443·8	367.465	Count of Burradale
SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.				
Lovely V. of Alvaglen (272 days)	G. H. Knowles, Nanango	10,879·45	395·085	Duke of Alvaglen
Lottie of Bellwood	S. J. Currant, Gunalda	7,887·3	333·644	Triumph of Oakvale
JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.				
Happy Valley Sunday 2nd	R. R. Radel, Coalstoun Lakes	10,101·25	431·125	Happy Valley Doncaster
Rhodesview Beauty 7th	W. Gierke and Sons, Helidon	9,150·65	351·523	Colonel Rose of Rosenthal
Dnalwon Fairy Floss III.	B. J. Nothling, Witta	7,737·6	236·373	Sir George of Dnalwon
Millstream Nita	W. J. Barnes, Cedar Grove	9,070·96	326·634	Magnet of Kurrawong
SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.				
Hillfield Duchess 15th	S. J. Lester, Mulgowie	8,800·20	323·626	Endeavour of Greyleigh
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Star II. of Alfavale	W. H. Thompson, Manumba road, Nanango	13,604·41	618·37	Reward of Fairfield

SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.				
Millstream Dolly	*W. J. Barnes, Cedar Grove*	7,784·85	339·59	Oakvale Captain
Valencia Dahlia II.	W. Turner, Riverleigh	7,36[illegible]·1	282·721	Excelsior of Alnebank
Pansy of Lynfield	F. E. Birt, Sexton	6,587·25	259·848	Lavender's Pride
JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.				
Sunnyview Fairy Bell	J. Phillips, Greenview, Wondai	8,183·18	356·047	Lovely's Commodore of Burradale
Sunnyview Fairy Fly	J. Phillips, Greenview, Wondai	8,549·4	347·815	Lovely's Commodore of Burradale
Blacklands Folly III. (264 days)	A. Pickels, Wondai	6,594·52	298·924	Orama of Blackland
Sunnyview Lulu (267 days)	A. E. Vohland, Aubigny	7,277·6	268·968	Lovely's Commodore of Burradale
Arley Polly V.	B. J. Nothling, Witta	6,806·5	264·297	Greyleigh Syntax
Homelea Irene	J. Savage, Humphrey	6,835·0	259·614	Expert of Springdale
Red Plum II. of Lynfield	F. E. Birt, Sexton	6,176·2	259·195	Lavender's Pride
Empress II. of Lynfield	F. E. Birt, Sexton	7,073·0	258·421	Lavender's Pride
Hillfield Susie 15th	S. L. Lester, Mulgowie	5,969·07	230·864	Mountain Home Royalist

JERSEY.

MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Oxford Bluebird	E. Burton and Sons, Wanora	9,354·95	543·995	Trinity Ambassador
Trecarne Rosella	T. A. Petherick, Lockyer	8,871·79	518·188	Trinity Officer
Westbrook Loxetta 12th	S. V. Abbott, Derrymore	8,718·37	424·669	Carnation Scots Noble
Trinity Victoria	F. P. Fowler and Sons, Biggenden	7,145·0	422·716	Lord Ettrey of Banyule
Langside Duchess	G. W. Young, Inverlaw	8,324·5	400·064	Masterpiece Yeribee of Bruce Vale
Inasfayl Juliette	McGeehan Brothers, Kairi	7,960·4	376·852	Werribee Starbrights Masterpiece II.
Langside Twylish Triplicate	G. W. Young, Inverlaw	7,312·7	353·837	Masterpiece Yeribee of Bruce Vale
SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.				
Lottie of Calton	J. Collins, Tingoora	13,770·63	684·424	Prince Clair of Calton
Trecarne Rosella 4th	T. A. Petherick, Lockyer	9,401·52	545·900	Trinity Officer

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY—*continued.*			
	JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.			
Glenview Audrey Twylish	F. P. Fowler and Sons, Coalstoun Lakes	8,580·0	577·993	Carlyle Larkspur 2nds Empire
Inasfayl Sweet Larkspur	McGeehan Brothers, Kairi	6,955·5	419·365	Werribee Starbrights Masterpiece II.
Langside Ruthinia	G. W. Young, Inverlaw	6,455·25	364·781	Masterpiece Yeribee of Bruce Vale
Trinity Irondele	J. Sinnamon and Sons, Moggill	6,192·43	358·368	Pilgrim of Oaklands
Langside Lassie	G. W. Young, Inverlaw	6,780·9	347·708	Masterpiece Yeribee of Bruce Vale
Matilda of Paradise	A. L. Walker, Don	5,916·25	328·467	Retford Earl Victor
Carnation Princess	W. Spresser and Sons, Redbank	5,275·03	313·881	Carnation Renown
	SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.			
Oxford Aster Daisy	E. Burton and Sons, Wanora	8,277·17	516·314	Trinity Ambassador
Carlyle Larkspur 23rd	F. Maurer, Darra	7,786·90	400·222	Woodside Vasilikas Volunteer
Lady Betty of Homeleigh	A. L. Walker, Dawn	6,533·0	360·123	Orleigh Golden King
G. N. Hazel	Cox Brothers, Maleny	5,733·0	345·689	Retford Royal Atavist
Carnation Gentle	W. Spresser and Sons, Redbank	6,118·24	340·336	Carnation Daisy's Hero
Lady Horden of Paradise	A. L. Walker, Dawn	5,534·2	330·023	Retford Earl Victor
	JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.			
Oxford Joyful Maid	E. Burton and Sons, Wanora	9,223·06	550·951	Trinity Ambassador
Trecarne Jersey Queen	[illegible]. A. Petherick, Lockyer	6,399·08	387·483	Trecarne Golden King
Oxford Ena	E. Burton and Sons, Wanora	6,387·29	374·760	Oxford Robin
Oxford Alwyn (258 days)	E. Burton and Sons, Wanora	5,202·84	330·351	Oxford Robin

	SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 270 LB.			
Oxford Queen Daffodil (268 days)	E. Burton and Sons, Wanora	6,755·9	414·451	Trinity Ambassador
Trecarne Rosella 6th	T. A. Petherick, Lockyer	5,729·74	354·368	Trecarne Golden King
Bellgarth Dawn	D. R. Hutton, Cunningham	5,979·68	332·611	Bellefaire Blondes Bellringer
Avocaview Lynda Belle II.	H. B. Roberts, Maleny	5,520·0	305·028	Rhondda Palatine Lad
Waltham Farm Flirts Lady	McGregor Brothers, Yalangur	6,794·15	304·938	Greenstock Gentle Boy
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.			
Brooklands Royal Cake	W. Conochie, Sherwood	8,345·1	473·535	Retford Earl Victor
Waltham Farm Duchess	McGregor Brothers, Yalangur	5,970·43	354·258	Trecarne Reminder
Glenview Brunette	W. S. Kirby, Byrnestown	5,472·5	323·461	Trinity Officer
Oxford Snow Queen	E. Burton and Sons, Wanora	5,130·58	318·583	Oxford Royal Renown
Langside Fifty Fifty (267 days)	G. W. Young, Inverlaw	5,040·45	300·315	Masterpiece Yeribee of Bruce Vale
Trinity Golden Wedding	J. Sinnamon and Sons, Moggill	5,001·82	281·504	Some Hope
Trinity Royal Meadow	J. Sinnamon and Sons, Moggill	4,981·17	277·782	Some Hope
G. N. Lubra	Cox Brothers, Maleny	5,356·2	274·416	Retford Royal Atavist
Carnation Victorious	W. Spresser and Sons, Redbank	4,530·95	274·163	Vinchelez Golden Victory
Bremerside Dell	J. Newman, Caboolture	4,689·0	271·586	Kelvinside Aristocrat
Carnation Paxie	W. Spresser and Sons, Redbank	4,665·04	269·861	Vinchelez Golden Victory
Pensilva Fern II.	McGregor Brothers, Yalangur	5,217·76	259·651	Kelvinside Favourites Raleigh
Selsey Linda	Queensland Agricultural High School and College, Gatton	4,637·1	258·92	Werribee Jupiter
Carnation Victory's Pride	W. Spresser and Sons, Redbank	4,016·29	248·922	Vinchelez Golden Victory
	FRIESIAN.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Towlerton Zara	F. C. Noller, Kumbia	13,280·13	491·499	Domino Belter King
Inavale April Flower	A. O. Stumer, Boonah	12,107·6	408·066	Cardyline Mascot
Brigalow Dinah	A. O. Stumer, Boonah	10,511·8	358·168	Inavale Ideal
	SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.			
Brigalow Gem II.	A. O. Stumer, Boonah	9,801·05	369·054	Inavale Victory
Burnbrae Alcartis Pontiac (271 days)	P. Wason, Kingaroy	10,802·25	348·673	St. Albans North Star

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	FRIESIAN—*continued*			
	JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.			
Brigalow Dazzler II.	A. O. Stumer, Boonah	9,459·71	348·081	Inavale Victory
	GUERNSEY.			
	SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.			
Laureldale Rosette	W. A. K. Cooke, Witta	7,691·95	397·978	Linwood Favour
	SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.			
Linwood Chimes	A. S. Cooke, Witta	8,292·2	373·104	Linwood Monitor
Laureldale Violet	W. A. K. Cooke, Witta	6,545·1	292·741	Linwood Favour
Laureldale Myrtle	W. A. K. Cooke, Witta	5,614·1	264·391	Linwood Favour
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.			
Laureldale Fairy	A. S. Cooke, Witta	5,248·1	244·856	Linwood Favour

TUBERCLE-FREE HERDS.

The following herds have been declared free from tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free :—

Owner.	Address.	Number in Herd.	Expiry Date.
H. H. Dight	Warwick	37	24/10/35
R. A. Slaughter	Clifton	16	31/10/35
Paterson and Paterson	Croxley, Oakey	78	28/11/35
Grimmett and Son	Sherwood	64	1/12/35
Clayton Brothers	Tinana	95	20/2/36
E. H. Heale	Riverdale, Kureen	34	22/2/36
C. Sentinella	Graceville	43	1/3/36
G. T. Fleming	Edge Hill, Cairns	28	16/3/36
D. R. Hutton	Cunningham	53	22/3/36
Mrs. F. Thomason	Highleigh, *via* Cairns	131	28/3/36
McGeehan Brothers	Kairi	104	3/5/36
J. B. Keys	Gowrie Little Plains	36	21/5/36
McGregor Brothers	Yalangur	45	28/5/36
E. G. Harlow	Kuranda	33	7/6/36
David Hope	Kuranda	61	7/6/36

ABORTION-FREE HERDS.

The following herds have been declared free of contagious abortion (Bang's disease), in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner.	Address.	Number in Herd.	Expiry Date.
H. H. Dight	Warwick	37	24/10/35
Grimmett and Sons	Sherwood	61	1/12/35
F. P. Allan	Stonleigh Dairy, Oxley	63	1/2/36
Clayton Brothers	Tinana	95	20/2/36
C. Sentinella	Graceville	43	1/3/36

WHITE CEDAR BERRIES POISONOUS FOR PIGS.

The Government Botanist (Mr. C. T. White) emphasises the danger of poisoning to domestic stock, and especially pigs, from the White Cedar (*Meila dubia*) berries, which are found very commonly on coastal Queensland and Northern New South Wales. In a statement issued recently he said that during the day the Department of Agriculture and Stock had received specimens of a number of berries from the Stock Inspector at Bowen, who said that skins of the berries had been found in the stomachs of pigs, which had apparently been poisoned by eating them. After an examination he had determined them to be the berries of the White Cedar, a tree very common in coastal Queensland and Northern New South Wales.

Judging from the number of specimens of these berries sent in during the fruiting season each year, he considered that many farmers were apparently unacquainted with the tree and the danger of allowing it to grow near pig yards and sties. The plant grew to the size of a large tree, with finely divided foliage, more or less deciduous in winter, sprays of lilac-coloured flowers, and bunches of yellow berries or stone fruits, which it bore in great numbers. The effect of the poison was narcotic, affecting the whole of the central nervous system. No specific antidote was yet known. Outside Australia the tree was widely distributed in India and the Malay Archipelago. Although the berries were so poisonous to pigs and some other domestic stock, fruit-eating birds, such as the flock pigeons, could eat them with impunity.

STUD PIG REGISTRATIONS IN THE HERD BOOKS OF THE AUSTRALIAN STUD PIG BREEDERS' SOCIETY, YEARS 1911 TO 1935.

Date.	Berkshire.	Middle Whites.	Large Whites.	Large Blacks.	Tamworth.	Poland Chinas.	Duroc. Jerseys.	G.O.S.	Chester Whites.	Wessex Saddlebacks.
1911	217	192	..	..	..	..	..	..	..	..
1912	73	61	..	5	..	..	..	..	..	..
1913	103	22	4	..	..	..	..	..	..	..
1914	286	125	22	..	14	..	..	..	..	..
1915	229	166	4	13	21	..	..	..	..	..
1916	254	69	53	1	4	14	..	..	..	..
1917	269	249	15	..	17	17	..	..	..	..
1918	684	316	11	..	13	14	1	..	..	..
1919	828	292	10	..	22	4	..	..	..	..
1920	365	140	8	..	22	3	..	..	..	..
1921	414	155	12	..	36	11	..	..	..	..
1922	613	220	5	..	51	10	..	..	..	..
1923	666	246	12	..	47	22	..	..	..	..
1924	585	263	9	..	61	28	..	..	..	..
1925	594	282	18	17	95	33	7	4	..	..
1926	998	352	60	22	145	82	29	61	..	..
1927	959	307	96	33	180	94	44	59	..	..
1928	515	135	113	13	160	75	53	55	..	..
1929	487	181	168	24	136	66	84	62	..	..
1930	690	142	309	34	198	52	133	119	4	..
1931	663	209	347	41	292	68	136	99	12	..
1932	563	136	226	28	237	14	44	45	8	2
1933	507	198	449	31	286	25	19	16	..	5
1934	456	187	540	29	221	15	8	11	..	6
1935	523	312	824	19	242	8	5	7	1	9
Totals	12,541	4,957	3,315	310	2,500	655	562	538	25	22

Total 25,425

Compiled from official figures by E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

In Memoriam.

GEORGE ROBERT PATTEN.

The death of Mr. George R. Patten, Senior Analyst in the Department of Agriculture and Stock, which occurred on the 6th June, is recorded with great regret.

The late Mr. Patten was born in 1880, and was a native of New South Wales. He received his first appointment in the Public Service of Queensland in 1902, when he became junior assistant chemist at the Bundaberg Sugar Experiment Station. In 1905 he was appointed first assistant chemist at that station. Five years later he was transferred to the Agricultural Chemist's Branch of the Department of Agriculture, Brisbane, as third assistant chemist, and advanced eventually to the position of senior analyst of that branch.

Mr. Patten's publications, many of which have appeared in this Journal, cover a wide range. He compiled a summary of experiments conducted with sugar-cane, and of soil and other chemical analyses from 1902 to 1923. The compilation was published afterwards by the Bureau of Sugar Experiment Stations as Bulletin No. 4 (1924), with a commendatory note by the late H. T. Easterby (then Director of the Bureau), in which he remarked:—"This summary entailed a great amount of time and elaborate work." He was a joint author of numerous bulletins and advisory leaflets on soil chemistry and cognate subjects, and among the more notable of these publications were "Soils of the Stanthorpe District" and "Tung Oil Fruit." He made many complete and very detailed analyses of rock specimens for other Departments and the Queensland University. He was a foundation member and honorary secretary of the Queensland Branch of the Australian Chemical Institute, and was honorary treasurer of the Institute at the time of his death. Among other activities associated with his work, he filled the office of a lecturer and examiner at the Queensland Technical College.

The late Mr. Patten was an accomplished musician and was a member of the old Brisbane Liedertafel for many years. Latterly he was associated with the Brisbane Apollo Club. He was a man of infinite kindness, possessing a warm-hearted, genial, cheery nature, happy in the performance of good works. He was interested especially in young people, and study groups from the secondary schools on their instructional visits to the departmental laboratories found in Mr. Patten a most obliging, courteous, and untiring demonstrator. His premature death came as a great shock to his colleagues, causing deep sorrow to them and to his wide circle of friends outside his official life.

The interment took place at the South Brisbane Cemetery on Saturday, 8th June. The large assemblage at the graveside was testimony of the high esteem in which he was held, and included the Minister for Agriculture and Stock (Hon. Frank W. Bulcock), Messrs. R. Wilson (Assistant Under Secretary), E. H. Gurney (Agricultural Chemist), A. E. Gibson (Director of Agriculture), Dr. H. W. Kerr (Director, Bureau of Sugar Experiment Stations), Messrs. R. Veitch (Government Entomologist), W. G. Wells (Director of Cotton Culture), C. J. McKeon (Director of Tropical Agriculture), many other departmental officers and representatives of the professional, commercial, and social circles of Brisbane. To his sorrowing widow and other bereaved relatives deep sympathy is extended.

Answers to Correspondents.

BOTANY.

Selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Rasp Wood.

J.A.T. (Brigalow)—

The specimens represent a species of *Haloragis*, or Rasp Wood, several species of which occur in Western Queensland. Some of them are minor weeds in cultivation, but we never heard of their being quite so bad as, apparently, this is on your property. The plant has the virtue, however, that it is quite a good fodder, and one species growing in the Warrego district, very similar to the one you sent, is looked on as a very valuable sheep fodder. It has the peculiarity of making the urine of sheep red or saffron colour. Observant men have told us that the sheep that feed on this plant are free from fly trouble, but this, we think, wants confirmation.

Boonaree.

D.M.C. (Mackinlay, N.W. Qld.)—

Your specimen represents *Heterodendron oleæfolium*, commonly known in parts of Western Queensland as "Boonaree." Sometimes it is called "Western Rosewood." It is a shapely tree, eaten readily by stock. The leaves, however, contain a prussic-acid-yielding glucoside, and if hungry stock are allowed to gorge themselves on it trouble may ensue. It is very rarely that any losses are experienced with the plant in Queensland, but a year or two ago there was a rather serious one in the Roma district, when hungry sheep had been allowed to gorge themselves on the leaves of this tree freshly felled and then went straight away and had a drink of water.

Cassia. Golden Shower.

M.J.K. (Brisbane)—

One of the most beautiful autumn-flowering shrubs in Queensland gardens is the common Cassia (*Cassia bicapsularis*), a native of tropical America, but one which has taken most kindly to the Queensland climate. It produces an abundance of seed, and plants raised from seed planted in the spring grow to shrubs 5 or 6 feet high, and bearing an abundance of flowers the following autumn. The plant lasts for a number of years, and older specimens—say, seven or eight years old, and left unpruned—attain the size of small trees. The plant responds very readily to pruning, and can be formed into a very bushy shrub or a small umbrageous tree as desired.

During the summer months one of the most beautiful flowering trees of Queensland gardens is the Indian Laburnum, or Golden Shower, botanically known as *Cassia fistula*. It is a native of India and Ceylon, but has taken most kindly to the Queensland climate, and when in flower the trees are a mass of large golden-yellow flowers borne in pendant racemes a foot or more long. In the neighbourhood of Brisbane pods are very freely produced, but in North Queensland the flowers are followed by long cylindrical pods a foot or more long, bearing numerous seeds packed transversely. Between each seed is a layer of sweetish flesh that is eaten as a mild purgative. In consequence the beans are sometimes known as "cascara beans," but they do not belong to the same family, and are in no way related botanically to the tree which produces the cascara of commerce. It belongs to the same family of plants which produce senna leaves; hence, no doubt, the purgative character of the sweetish substance surrounding the seeds.

Garlap Nut.

S.A.P. (Townsville)—

The specimen is certainly not the Garlap tree. It is *Sesbania aculeata*, the Sesbania Pea or Gulf Pea, a very common plant in North Queensland. The seeds of this plant were evidently in the soil in which the Garlap nut was planted. The Garlap nut is a native of the Solomon Islands and New Hebrides, and is one of the finest edible nuts known. It possesses, however, a very hard shell.

Mackay District Grasses Identified.

Dow's Creek Project Club (via Mirani)—

The specimens have been determined as follows:—

(1) *Eleusine indica*, Crowsfoot Grass. Common in Queensland as a weed of cultivation along roadsides, &c. It is eaten readily by stock, and has a high food value. However, it contains a prussic acid-yielding glucoside, and if eaten in quantity by hungry stock might cause trouble.

(2) *Rhynchelytrum repens*, Red Natal Grass. An introduced grass, native of South Africa, but now very abundant in coastal Queensland. It is not usually looked upon as of much consequence as a fodder, though it is useful in the form of "chop-chop."

(3) *Sporobolus Berteroanus*, Parramatta Grass. A native grass usually rejected by stock.

(4) *Panicum maximum*, Guinea Grass. A very useful pasture grass relished by stock, and very nutritious. It is fairly commonly cultivated in Queensland.

(5) *Themeda australis*, Kangaroo Grass. A native grass, palatable and nutritious when young, but becoming rather coarse at maturity. It disappears rapidly under stocking, and for this reason is often plentiful inside railway enclosures, when it has long since disappeared from the adjoining paddocks.

(6) *Setaria pallidifusca*. Usually known as Pigeon Grass. It should be quite a useful grass.

(7) *Heteropogon triticeus*, Giant Spear Grass. A coarse native grass, concerning whose properties little is known.

(8) *Digitaria marginata*, Summer Grass. Common in Queensland as a weed of cultivation. Stock seem to be fond of it.

(9) *Axonopus compressus*, Broad Leaved Carpet Grass or Mat Grass. For second-class country this grass is of some value, but if it invades paspalum pastures it soon becomes dominant, and considerably reduces the carrying capacity.

(10) *Paspalum orbiculare*. A native grass common in coastal Queensland. It is of little value as a fodder.

Bamboos.

"Sap" (Townsville)—

The best bamboo to plant around Babinda would probably be the common bamboo, cultivated everywhere in Queensland. This is *Bambusa arundinacea*. It is best propagated from off-shoots from the big stools, although these are sometimes very difficult to get out. He could establish them from sections of the stem, putting, say, one node well below the soil, and another somewhere about soil level, and keeping them moist, although clumps would be formed quicker from the off-sets. Another bamboo, not so robust as the common one, but slightly more handsome, is *Bambusa gigantea*. This is not so frequently seen, but it has bright yellow stems, each section with a rather thin streak of green down it. Some of the smaller ones might serve the purpose in view, and of these perhaps the best would be the black bamboo, which people prize so much for fishing rods. This is *Phyllostachys nigra*. All these three species are cultivated in Queensland, and probably your local Botanic Gardens would be able to supply suckers. Our experience here has been that bamboos are rather disappointing in preventing erosion. They certainly will do it under ordinary circumstances, but very heavy floods with a great rush of water will undermine them and carry them away. Some other grasses might serve your purpose better, and would be somewhat quicker of growth. *Arundo Donax*, the Spanish reed, cultivated in Queensland in both plain green and variegated varieties, we think would be worthy of trial.

Wild Salvia.

J.D. (Rathdowney)—

Your specimen is Wild Salvia (*Salvia coccinea*), a native of the warmer parts of North and South America, but now established as a weed in many parts of the world. It is quite common in many parts of Queensland, and has come under suspicion as causing abortion in cows. The plant has this reputation abroad, as well as in Australia. The use of oils of the common pennyroyal and other members of this family as abortifacients is well known. The plant is harmful, in any case, if eaten in quantity.

South Burnett Grasses Identified.

G.H.K. (Barambah)—

(1) *Chloris divaricata.* A native grass widely spread over the State. In the Maranoa district and other parts of Western Queensland it is regarded as an excellent fodder.

(2) *Panicum decompositum.* A native grass sometimes known as "barley grass." It is palatable for stock in the young stage only, as it soon becomes hard and papery.

(3) *Digitaria marginata,* Summer Grass. A common weed of cultivation. Stock are rather fond of it.

(4) *Cynodon Dactylon,* Common Couch Grass.

(5) *Panicum decompositum.* See No. 2. A number of forms of this plant are found in Queensland.

(6) *Capillipedium parviflorum,* Scented Top. A native grass common in forest country. In some parts of Queensland it is looked upon as an excellent fodder.

(7) Leaves only. Flowers required for identification.

(8) Leaves only. Flowers required for identification.

(9) *Chloris ventricosa.*

(10) *Eragrostis leptostachys,* Paddock Love Grass. A common constituent of the average native mixed pasture.

(11) *Chloris divaricata.* See No. 1.

(12) *Aristida* sp. A species of three-awned or three-pronged spear grass.

(13) *Eragrostis parviflora,* Weeping Love Grass.

(14) *Triticum æstivum,* Wheat.

(15) *Bromus uniodoides,* Prairie Grass.

(16) *Stenotaphrum secundatum,* Buffalo Grass.

(17) *Echinochloa crus-galli,* var. *edulis,* White Panicum.

(18) *Chloris Gayana,* Rhodes Grass.

(19) *Avena fatua,* Wild Oats. Although this was labelled Algerian oats, it does not agree with description and figures of that species, but seems rather to be wild oats.

(20) *Sorghum leiocladum.* A native sorghum for which we have not heard a common name.

(21) *Eriochloa* sp. Most of the Eriochloas are good fodders. They are often called early spring grasses or dairy grasses, but neither of these names is particularly appropriate.

(22) *Dichanthium sericeum,* Blue Grass. One of the best of our native grasses.

(23) *Rhynchelytrum repens,* Red Natal Grass. Very common in coastal Queensland. Generally rejected by stock, except when chaffed up.

(24) A form of *Themeda australis,* Kangaroo Grass.

(25) *Pennisetum alopecuroides,* Swamp Foxtail.

(26) *Themeda australis,* Kangaroo Grass. In its young stages is quite a good fodder, but it becomes harsh and unpalatable at maturity.

(27) *Arundinella nepalensis.*

(28) *Chloris virgata,* Feather Top Grass. This is closely allied to Rhodes grass, and is sometimes called feather top Rhodes. However, stock generally reject it, although it is reported to be of some use in the form of hay.

(29) *Carex inversa.* A sedge, not a true grass.

(30) *Panicum decompositum.*

(31) *Eragrostis cilvanensis,* Stink Grass. Common as a weed of cultivation in the warmer regions of the world. It is not regarded as of much consequence as a fodder, although working horses have been said to eat it.

(32) *Setaria glauca,* Pigeon Grass.

(33) *Eragrostis elongata.* A love grass.

(34) *Juncus communis.* A rush, not a true grass.

(35) *Echinopogon nutans.* Rough bearded grass.

(36) *Fimbristylis deparyserata.* A sedge, not a true grass.

(37) Leaves only. Impossible to determine in the absence of flowers.

(38) *Eleusine indica*, Crowsfoot Grass. Usually found as a weed of cultivation on roadsides, &c. Stock eat it readily, and it is quite nutritious. However, it contains a prussic acid-yielding glucoside, and if eaten in quantity by hungry stock would probably cause trouble.

(39) *Chloris divaricata.*

(40) *Paspalidium flavidum.*

(41) *Heteropegon contortus*, Bunch Spear Grass. Quite a good fodder in its young stages, although at maturity the sharp seeds are rather dangerous.

Grasses Identified.

H.T. (Proserpine)—

(1) *Sorghum fulvum.* A native sorghum, very abundant in your district, and on the islands of the Whitsunday Group.

(2) *Aristida ramosa.* A three-pronged or three-awned Spear Grass.

(3) *Rottbœllia formosa.*

(4) *Eriachne* sp. Nos. 3 and 4 are native grasses, for which we have not heard local names.

(5) *Brachiaria foliosa.* A native grass sometimes known as leafy panic grass. It generally favours rather shady situations.

(6) *Arundinella nepalensis.* A very coarse grass, very widely spread in Queensland. We have not heard a suitable local name given to it.

(7) *Hackelochloa granularis.* A small grass full of grain; should be nutritious.

(8) *Dactyloctenium ægyptium*, Coast Button Grass.

(9) *Cymbopogon* sp.

(10) *Panicum Mitchelli.* A native panic grass—most of the native panic grasses are useful fodders in the average mixed pasture.

(11) *Eulalia fulva*, Brown Top Grass. Widely spread in Queensland, and usually looked upon as a good fodder.

(12) A mixture of *Pseudopogonatherum contortum*, the smaller plant with the brownish seed heads, and *Bothriochloa decipiens*, bitter or pitted blue grass or red grass, which has rather silvery seed heads. The latter is an inferior species which has become dominant in some of the coastal pastures of Queensland and New South Wales, considerably reducing their carrying capacity.

(13) *Cenchrus echinatus*, Mossman River grass or burr grass.

(14) *Panicum maximum*, Guinea Grass.

(15) *Tridax procumbens.* A very common weed in Queensland, a native of Tropical America. We have not heard a common name for it.

(15A) *Anisomeles salvifolia.* Both this and the preceding bore the same number, but this is evidently the plant referred to as No. 16 in your letter.

(17) *Leucas linifolia.* A common tropical weed naturalised in North Queensland.

(18) *Flemingia involucrata.* A native legume; should be fairly nutritious.

"Carpet Grass." "Hula Grass."

R.S. (North Arm)—

Of the two grasses the one with the narrow leaves is *Axonopus compressus*, the narrow-leaved mat grass or carpet grass. This grass has been established in Queensland for a number of years past, and has a definite value for second-class country, such as a good deal of that between the North Coast railway line and the coast. The only disadvantage of it is that it gets into the ordinary paspalum pastures, becomes very difficult of eradication, and very much decreased the carrying capacity of the pasture.

The other grass with broader, bright-green leaves and spikes of small yellow seeds is *Paspalum conjugatum*, variously known as mission grass, yellow grass, sour grass, and hula grass. It has been in North Queensland for a great number of years, but only in recent times has travelled south. The general opinion in North Queensland is that if it gets into paspalum country, particularly in tropical wet places such as some of the wetter and warmer parts of the Atherton Tableland, it will ruin the paspalum pasture. It is not generally regarded as having much value as a fodder wherever it grows, although we have seen working mules feed extensively on it in New Guinea in the absence of other suitable fodders, and work quite well on it.

No charge is made for this advice and we would be very pleased to name and report on any specimens you care to send from time to time.

Grasses Identified.

F.J.I. (Gooroolba)—

Your specimens represent:—

(1) *Aristida prœalta.* A three-pronged or three-awned Spear Grass.

(2) *Sorghum halepense,* Johnson Grass. A very bad pest of cultivation, particularly difficult to eradicate because of its underground rhizomes.

(3) *Eragrostis leptostachys,* Paddock Love Grass. A native grass fairly common in the average native mixed pasture, and usually looked upon as quite useful.

(4) *Chloris Gayana,* Rhodes Grass. A useful grass for subcoastal country, particularly on hillsides.

"Poison Corkwood."

H.I.N.R. (Cooroy)—

Your specimen represents *Duboisia myoporoides,* sometimes known as "poison corkwood." The plant is very poisonous, but usually is left untouched by stock. In one or two cases, however, we have observed stock punishing bushes. Some reference was made to this plant in the Press some eighteen months ago, a child having been poisoned by it at a place on the North Coast of New South Wales. It is sometimes called "soap-box," as you mention, although this vernacular is more generally applied to a different tree.

A Black Wattle.

A.B. (Charters Towers)—

It is very difficult to tell wattles from the leaf only, but we think the one you sent is a form of the Queensland Black Wattle, *Acacia Cunninghamii,* common along the Cape River and Torrens Creek, North Queensland. Many wattles, quite apart from the mulga and some of the best-known sorts, make excellent drought fodder for both sheep and cattle. We have not heard of the present species being used before, but have no doubt that it could be used successfully. As you state, impaction is a possible result, but the same remark applies to almost any foliage of wattles and other plants, particularly from the inland parts, as most of them are rather fibrous, but this is a risk that would have to be taken.

A Relative of Rhodes Grass—Chloris Barbata.

K.B.McR. (Mareeba)—

Your specimen is *Chloris barbata,* a grass widely spread over the tropical regions of the world. It is hard to say now where it originated, although we think it is regarded generally as a native of Tropical America, from whence it has spread practically to all tropical countries. It is closely allied to Rhodes grass, and was boomed as a fodder here some few years ago, but seems to have gone out of favour. It is very abundant in North Queensland, particularly in coastal areas from Rockhampton to Cairns, but we cannot say that we have seen stock eat it to any extent. Some of these *Chloris* grasses allied to Rhodes grass stock seem to favour when they are dried or made into the form of hay, rather than when they are green and luxuriant.

Zamia Poisonous to Stock.

R.S. (Port Douglas, N.Q.)—

All members of the Zamia family are dangerous. Quite a number of them occur in different parts of Queensland, some of them quite large. The one in your district is probably *Bowenia spectabilis,* a zamia or cycad of fernlike appearance and bearing a cone of nuts which fall all round the base of the plant. Trouble in this case may be caused either through eating the young shoots or ripe seeds when they fall from the plants. The poisonous nature of these plants has now been definitely proved by feeding tests. It is certainly dangerous to allow pigs to run in country where zamia nuts are in abundance. One of the species of zamia that occurs in New South Wales recently caused severe losses in travelling sheep. These sheep had been used to hand-feeding of maize and other concentrated foods. In travelling through a patch of zamia country they ate a number of the nuts, with the consequence that severe losses occurred.

Trees Suitable for the Charleville District.

T.C. (Charleville)—Trees that we think would succeed in Charleville:—

Celtis sinensis, the so-called Portuguese elm. This tree is deciduous but we do not think that this would matter as shade is not so important during the winter months, and it is well worth growing in Western Queensland. We think it would thrive there and it has the added value that the leaves are very good fodder for stock. Seeds and plants are not stocked by nurserymen, but may be obtained from the Botanic Gardens, Brisbane.

Sterculia diversifolia, currajong. Probably one of the best all-round trees for planting in your district.

Sterculia rupestris, the narrow-leaved bottle tree.

Melia dubia, the white cedar. It does quite well but is rather subject to borer attack.

Schinus molle, Pepper tree or pepperina.

Bauhinia Hookeri, Queensland ebony; one of the most beautiful native trees. There are some fine examples about Roma, but we do not remember having seen any about Charleville. It is well worth growing. Seeds and plants are not, as a general rule, obtainable through the ordinary commercial channels, but we think plants may be obtained from the Botanic Gardens, Brisbane, or from the nursery of the Brisbane City Council. It is rather slow-growing.

Following are some suggestions for trees to grow. We do not remember having seen them about Charleville, but we think they are well worthy of trial:—

Flindersia australis, Crow's ash. The same remarks apply regarding supplies as to *Celtis sinensis* and *Bauhinia Hookeri.*

Jacaranda mimosæfolia, the common jacaranda.

Calodendron capense, Cape chestnut.

Nephelium tomentosum.

Schottia brachypetala.

Ceratonia siliqua, carob bean.

Native Grasses and Fodder Plants.

R.V.O'B. (Cunnamulla)—

The remarks contained in your letter are appreciated, and we are glad that you find the wireless talks from the department interesting. Regarding books dealing with your country, we are afraid there is nothing very comprehensive. A useful little book is "Australian Grasses and Pasture Plants," by Fred Turner, published by Whitcombe and Tombs, price 4s. It is not a very comprehensive work, but a lot of the main Western grasses and fodder trees are mentioned, their distribution, analyses, &c. A most useful book by the same author, but probably now out of print, is "The Forage Plants of Australia," published by the Government Printer, Sydney, away back in 1891. Mr. Turner is still alive, although now a very old man. "The Grasses and Fodder Plants of New South Wales," by E. Breakwell, deals mainly with the grasses of the dairying region. It is obtainable from the Government Printer, Sydney, price 6s. 6d., or through any bookseller.

Regarding the timbers and their uses, you would find "The Timbers and Forest Products of Queensland," by E. H. F. Swain, a useful work. It is obtainable from the Government Printer, Brisbane, price 6s. 6d. paper covers, 11s. 6d. bound in cloth.

We would be very pleased to identify and report on any specimens you care to send. Of grasses, a whole stem doubled backwards and forwards so as to fit comfortably in a small piece of newspaper, should be sent. It is always a help if one or two additional seed heads can be included. Of herbage plants, and shrubs, trees, &c., a shoot a few inches long, bearing leaves, and, if at all possible, flowers or fruits, should be forwarded. Number each specimen and retain a duplicate, when names corresponding to numbers will be returned. No charge is made for this service.

White Dutch Clover. Guinea Grass.

R.S.P. (Yungaburra, N.Q.)—

It is rather difficult to identify clovers satisfactorily from single leaves, but we think there is little doubt the one you sent represents the common White Dutch Clover (*Trifolium repens*). It usually comes in about June, and lasts to about the beginning of November. We think it is undoubtedly the best clover, generally speaking, for Queensland conditions, particularly for sowing in the average paspalum pasture.

In reply to your inquiry regarding Guinea grass, seed is not usually stocked by nurserymen; this is mostly for the reason that the seed has very poor germinating qualities, and the percentage of germination is generally small. The only satisfactory method is to gather the seed straight off the plant and sow it right away. Guinea grass is fairly common in North Queensland in different places, and you should have no difficulty in establishing a small plot yourself, and getting your own seed supply from this.

Flame Thrower.

"INTERESTED" (The Head, via Boonah)—

1. A firm handling the flame thrower for destroying weeds is J.C.A. Products, 229 Adelaide street, Brisbane.
2. Its approximate cost is £12 15s.
3. Its approximate operating cost is 2s. per hour.
4. The fuel used is Diesel engine crude oil costing 7d. per gallon.
5. The company would probably be pleased to arrange for a demonstration on your farm.

Stagger Weed.

C.T. (Mount Larcom)—

The specimen represents a young plant of the stagger weed (*Stachys arvensis*). This weed is one of the commonest winter and early spring weeds of cultivation in Queensland. It has the peculiar effect of causing "staggers" or "shivers" in working stock. They recover, however, when taken off it. It has no effect on ordinary dairy stock, calves, or resting horses. It is only when stock are driven or excited in some way that the symptoms are manifested. It is often called mintweed, but is not to be confused with the mintweed or wild mint that has caused so much concern on the Darling Downs and some parts of Central Queensland.

Johnson Grass.

H.C. (Miles)—

We have no pamphlet dealing with prussic acid poisoning of cattle by Johnson grass. Johnson grass is worst in its young stages, and, like most members of the sorghum family, is least harmful when in full seed. There is always a risk in feeding directly on Johnson grass, and stock should not be allowed on to it when it is heavy with dew, or when the cattle are empty and very hungry. If cut and allowed to wilt and then fed, either long or chaffed, the danger is minimised. Generally, at this time of the year Johnson grass is in a very old stage, and not particularly suitable for cutting, but can be grazed off, provided reasonable precautions are taken.

Ten Most Intelligent Animals.

To settle once and for all the age-old debate as to which is the more intelligent—the horse or the dog—Dr. W. Reid Blair, Director of the New York Zoological Park, has graded what he considers the ten most intelligent animals as follows:—

1. Chimpanzee	6. Beaver
2. Orang-utan	7. Domestic horse
3. Elephant	8. Sea Lion
4. Gorilla	9. Bear
5. Domestic dog	10. Cat

General Notes.

Staff Changes and Appointments.

A number of officers of the Aboriginal Department who are stationed in the Torres Strait Islands and Palm Island and Missionaries in charge of coastal mission stations in North Queensland have been appointed Honorary Rangers under the Animals and Birds Acts and the Native Plants Protection Act. These are—

Messrs. J. N. Delaney, Superintendent, Palm Island Aboriginal Settlement; F. N. Julian, Deputy Superintendent, Fantome Island Lock Hospital; G. H. Schwarz, Missionary, Cape Bedford Mission, via Cooktown; W. W. McCullough, Missionary, Yarrabah Mission, Cairns; G. H. Wilson, Missionary, Mornington Island, via Burketown; P. R. Frith, Teacher, Mabuiag Island, Torres Strait; H. W. Armstrong, Teacher, Foid Island, Torres Strait; P. H. Currell, Teacher, Darnley Island; F. P. May, Manager, Aboriginal Industries, Badu Island, Torres Strait; L. R. Butler, Teacher, Murray Island.

This action has been taken in order to protect, as far as possible, plant and bird life on the Northern coast and islands adjacent thereto.

Mr. F. A. Atherton, Koumala, has been appointed Canegrowers' Representative on the Plane Creek Local Sugar Cane Prices Board, in place of Mr. E. J. Walsh, resigned.

The appointment of Mr. V. Martin as Assistant Cane Tester at Racecourse Mill has been cancelled from 12th July, 1935; Mr. St. C. G. Fanning, Assistant Cane Tester, has been transferred from Isis to Racecourse Mill from 12th July; Mr. F. A. van Lith, Assistant Cane Tester, has been transferred from Cattle Creek to Isis Mill; and Mr. H. Lawrie, of Fairfield, has been appointed Assistant Cane Tester at the Cattle Creek Mill as from 12th July, 1935.

Mr. W. H. Bechtel, lately Manager of the State Farm at Kairi, and Instructor in Agriculture, Department of Agriculture and Stock, will be attached to Atherton.

The following transfers of Officers of the Department of Agriculture and Stock have been approved:—

Messrs. T. S. Tuck, Slaughtering Inspector, from Coolangatta to Townsville; M. Custance, Slaughtering Inspector, from Townsville to Coolangatta; J. A. O'Neill, Inspector of Dairies, from Gayndah to Gladstone; and M. N. Muller, Stock, Slaughtering, and Dairy Inspector, from Gladstone to Mundubbera.

Plywood and Veneer Board Levy.

The Plywood and Veneer Board Levy Regulations published in the "Government Gazette" on 23rd February, 1935, empowering such Board to make a levy to provide for its administrative expenses, are extended by Regulation approved to-day, and shall apply to all pine plywood and veneer delivered between the 3rd May, 1935, and the 2nd May, 1936, by a grower in pursuance of an order allocated by the Plywood and Veneer Board.

Stanthorpe Hail Insurance Scheme.

Regulations under the Primary Producers' Organisation and Marketing Acts have been approved to-day which will empower the Committee of Direction of Fruit Marketing (constituted under the Fruit Marketing Organisation Acts, and deemed to be a commodity board in pursuance of section 29 of the above firstmentioned Acts) to conduct a ballot amongst fruitgrowers in the Granite Belt area upon the question of making a levy on the growers of apples, apricots, grapes, nectarines, peaches, pears, and plums to raise money for the establishment and maintenance of a fund for the purpose of effecting insurance against hail, and to be known as "The Stanthorpe Fruit Hail Fund." A number of growers have requested that a poll be taken on the question of the establishment of the fund and the making of the levy, and the regulations prescribe the procedure in connection therewith. Growers concerned for the purposes of such poll and entitled to vote shall comprise all those who declare that they expect to have apples and/or apricots and/or grapes and/or nectarines and/or peaches and/or pears and/or plums grown or growing for sale in the Granite Belt area during the period 1st October, 1935, to 1st April, 1936. The ballot will be conducted by the Committee of Direction of Fruit Marketing.

Weight of Battens on Hay Bales.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock), in referring to frequent complaints as to the excessive weight of battens used on bales of hay pressed in this State, called attention to Regulations under the Stock Foods Acts, which provides the total weight of battens shall not be greater than 10 per cent. of the gross weight of the bale. In order to achieve this and to provide for a more uniform pack, it is prescribed that the total number of battens per bale shall not exceed eight in number. Each batten must not be of greater length than the bale, and be not more than 3 inches wide and five-eighths of an inch thick. The Minister stated that necessary action would be taken to enforce this provision.

New Sanctuaries Proclaimed.

The Cooby Creek Reserve, in the Toowoomba district, has been declared a sanctuary under the Animals and Birds Acts for the protection of native animals and birds.

Orpheus Island, in the Palm Island group, has also been declared a sanctuary, and Mr. G. W. Morris, of Dunk Island, has been appointed an honorary ranger in respect of this island.

Mr. T. Broom, the lessee of Poole Island in Port Denison, Bowen, has also been appointed an honorary ranger under the Acts.

An Infectious Disease of Poultry.

By Order in Council issued recently in pursuance of the provisions of "*The Diseases in Poultry Act of* 1923" Infectious Laryngo-tracheitis has been declared a disease under the Act.

SISTER KENNY'S METHOD—CLINIC OPENED IN BRISBANE.

Thus "Pollyanna" in "The Queensland Producer"—

"There is no appeal to Queenslanders so great as that of a sick or crippled child, and one would give his last penny to try every possible means of obtaining relief. It is no use telling parents that no more can be done. There is always the hope that something new can be tried, and that 'something' will bring renewed health and strength.

"Only a few years ago, a friend's little girl developed arthritis, and the most distinguished physician of the day said to the parents in the most kindly way, 'I cannot do any more for your little girl; yet I know you will not believe me, and will go on spending your money!' They did go on spending, and kept themselves poor.

"It is the same to-day, and Sister Kenny's promise of help was sure to be rushed by hopeful fathers and mothers seeking for their children relief from that terrible enemy—infantile paralysis. Fortunately, a Government sympathetic to those in poor circumstances is financing the clinic, and the opportunity for relief is open to country as well as town residents.

"CENTRAL SITE.

"The clinic is in George street, two blocks from Queen street, and easily reached from the tramline in that main thoroughfare. The premises are an old two-storey house opposite the Executive Buildings. Sister Kenny is there at present, with Dr. Rountree, a fully qualified lady who was a resident medical officer in Townsville, and ten nursing assistants. One hundred children have already been registered, and it is said provision can be made for 260 patients. The children must be brought there daily, for there is no residence attached. Possibly as the clinic develops a residence with verandas and garden will be found for country people.

"The Home Secretary (Mr. Hanlon) must be praised for his benevolent effort to help suffering children, and readers of the 'Queensland Producer' will send the most loving thoughts to them with prayers for their recovery. One could write at length on the cases already brought in to the clinic—of little ones with maimed limbs, the dragging of little feet, limbs encased in irons, little bodies not able to sit or stand, little heads not able to be controlled. Please God, Sister Kenny has found some method of helping them!"

Rural Topics.

Country Town Libraries.

Writing to the editor of the "Sydney Morning Herald," a correspondent (C. G. C. Christie) had this to say:—

During the last few months I have had occasion to visit many country towns, and made it a point to visit the libraries available to the public. In almost every instance I found a total and deplorable disregard of one of the most important reasons for their existence—namely, as treasuries of local history and biography, a popular repository of anything procurable, whether printed page, manuscript, or picture that tells aught of the town and district pioneers. I found practically nothing to illustrate the social, intellectual, and religious movements amongst their people; no faithful records of incidents, sayings and doings, amusements, industries, manners, and customs. The garnering of such local matter need cost but little. In the meanwhile our store house of historical data, the Mitchell library, is dependent upon the meagre gleanings of one or two individuals who keep scrap books, which rarely reach any repository where they are available as historical records. The builders of country libraries should never forget that there is a duty encumbent upon them to gather together such data, as well as administering to the other immediate literary tastes of their subscribers. I would even go so far as to suggest that every library in the State should be affiliated with our State Public Library and be expected, in return for subsidies, to supply the chief Public Librarian, and in particular, the Mitchell Library, with local historical data.

What Mr. Christie has said of the country town libraries of New South Wales applies with equal force to Queensland. There are, however, some notable exceptions, including Dalby, Maryborough, Bundaberg, and Townsville.

The English and Australia.

Thus T. D. Burling, in the correspondence column of the "Sydney Morning Herald":—

When the Boer War was being fought some Boers asked, "Who are these Australians who are coming?" One old Boer replied, "They are awful monsters; eleven of them licked All England!" Well, there are millions of Englishmen who do not know much more about Australia. They know about our cricketers, tennis players, and have heard we have a big bridge. This week I was spending a day with an Australian, though he was born in Sheffield, and came out here forty years ago. He has had several trips home. He told me that in Sheffield at the largest business place the owner was absolutely bewildered when he informed him that we have in Sydney and Melbourne very much larger shops than any in England except London, and quite as large as any in London. One of the passengers coming out with him asked him would there be any decent hotels in which to board in Sydney. A number of immigrants have gone home and bitterly attacked Australia, and, of course, misrepresented it. I have much sympathy with those people, for they came out with a small capital, which they lost. They came out quite ignorant of Australian conditions. They went on the land totally ignorant of the difference between Australian farming and that of Cambridgeshire, England. They declared when back in England that false inducements were offered them from Australia House.

I meet hundreds of immigrants from England (not nearly so many during the last year or two); they arrive here with the idea Australia is much like England, only a little bigger. When they discover Perth is as far from Sydney or Melbourne as London is from Moscow, they are naturally bewildered. Then they hear about our States, and are absolutely dumbfounded when they find they are larger than Yorkshire. The very first lesson Englishmen contemplating coming to Australia should be on the geography. They should be told, first, that Australia is just about the same size as all Europe. The climate is best in the world. The population is far too small. That we produce other things besides wool. That Australia has fewer foreigners than any other part of the Empire, including Great Britain itself. That young people are the best to come to Australia. They should be told about our unionism, and it is not always easy to get a start, but young people, men or women, are safe to make good if they are willing to work. They cannot pick up sovereigns in the street, but it is as easy to spend money in Australia as in England, and just now not much easier to earn it. They should also be taught that in business, in trades and professions (miners, farmers, workers) Australians are up to a very high standard; therefore, competition is very keen. But Englishmen generally do not know Australia, and immigrants ignorant of Australian conditions are very heavily handicapped. It is not fair to them to come out so badly informed.

Dairy Hygiene Means High-quality Cream.

Seldom have the main essentials of dairy hygiene been more forcibly and more strikingly expressed than in the closing remarks of the Scotch lecturer to a class of veterinary students. "Gentlemen," he said, "all that you need to remember is that the cow produces milk and dung with equal facility. The whole secret of producing clean milk lies in keeping the two apart."

If the speaker's bluntness is excused on the score of his nationality, and the remarks interpreted in a general sense, it must be admitted that they contain a good deal of truth. Good butter, good cream, and good milk all depend upon the maintenance of a satisfactory standard of cleanliness.

Milk, as produced by a healthy and properly fed cow, is in itself absolutely pure, but between the process of milking and the delivery of the cream at the factory there are numerous opportunities for it to pick up all kinds of foreign materials and flavours.

The greatest danger lies not in the visible dirt, but in the microscopic sources of infection. It is such material that the lecturer includes in his expression. He reminds us in effect that the outside of a cow is comparatively unclean compared with the inside of the udder.

It is quite definite that the quality of butter depends primarily upon the quality of the cream supplied to the factory.

Over-ripe cream is caused by excessive acidity which develops when cooling is not practised after separation. To prevent, separate at a test of not lower than 45 per cent. and cool immediately afterwards. Store in a cool place and do not allow too long periods to elapse between deliveries to the factory.

Fermented cream results from the growth of certain gas-producing germs in the product. These organisms come originally from cow manure, and gain entry into the milk in the yard. Fermented cream is an indication that milk is being produced under unclean conditions.

Manure should be removed promptly from the cow shed. Strict attention should be paid to cleaning the plant and premises. Use boiling water for scalding utensils morning and evening. Wash each cow's udder and milk with clean hands. Cool the cream after separation.

Stale cream is caused by holding it too long at the dairy or by adding a small amount of left-over cream to the next can. The method of prevention is obvious.

Another defect arising from infrequent factory deliveries and caused by over-staleness, uncleanliness, and germ infection is that of rancid or cheesy cream. This class of product is usually condemned as unfit for butter-making. A thorough cleansing of buckets, separators, milking machines, &c., is recommended, together with better regulated deliveries.

An unclean flavour in cream is produced by faulty cleaning of milking machines, separators, and other utensils; by the use of old, broken and rusty vessels; using cloths for washing up, and by unclean methods in the dairy. Prevention lies in thoroughly washing all dairy utensils and in scalding them well in boiling water. This must be done immediately after each time they are used. Use clean, sound brushes instead of rags, and adopt cleanly methods throughout. Do not mix hot and cold cream. Wait until all is thoroughly cool first.

The grazing of cows on rank growth of some weeds, clover, lucerne, and other feeds may give rise to feed flavours in cream. If possible, allow such fodder immediately after milking. Then remove the cows to ordinary pasture. Cool and aerate the cream after separation.

Curdy cream occurs when the separated product is too thin—below 38 per cent.—and not kept cool. Cream should be skimmed to contain not less than 42 per cent. butter fat, be cooled immediately after separation, stirred frequently with a clean, tinned, metal stirrer and kept cool during storage.

Germ infection from swamps, dams, and low-lying paddocks is responsible for ropy cream. Cows should be prevented, as far as possible, from wading in such places; udders should be washed thoroughly before milking. Whitewash dairy and bails; scald utensils with boiling water to remove infection.

A tallowy flavour is due to sunlight shining on the cream. This sets up a chemical change, particularly with high-testing cream of 50 per cent. and over. The same defect may be caused by a germ infection. Keep the cream away from direct sunlight. Do not expose excessive surfaces of cream to the air for any length of time, and keep all utensils and surroundings clean.

Rusty cans and utensils and unclean tinware cause metallic flavours. Discard all defective vessels. Use only well-tinned seamless cans and buckets.

Milk and cream have an exceptional capacity for quickly absorbing all kinds of flavours, and should not be left in a room where the exhaust fumes from the oil engine or odours of the engine are prevalent. Keep the cream away from oil smells, such as that arising from oil on the floor or on the separator block; from smoke from the fire, any strong-smelling materials, chemicals, and disinfectants. A room with a clean pure atmosphere is the best for storing cream. Do not wash dirty utensils with water from the engine jacket.

WASHING UDDERS.

A "cowy" flavour is the result of an unclean condition of the bails, floors, yard, &c., not washing the udder, milking with dirty hands, milking unhealthy cows, or of using the milk too soon after calving. The udders and teats should be washed and milking done with clean hands. Bails should have concrete floors, and the yard should be kept clean. Never separate the milk from sick cows that have just calved.

Culture and Agriculture.

"How can he get wisdom that holdeth the plough, and that glorieth in the goad, that driveth oxen, and is occupied in their labours, and whose talk is of bullocks?"—Ecclesiasticus, xxxviii., 25.

Here is at once a riddle and a contemptuous estimate of the husbandman. It is not so long since the toiler on the land—the man who produces food and clothing, the only absolute human necessities—was held in disdain for the sluggishness of his mind and the narrowness of his intellectual vision. But the byword "clod," as denoting mental poverty, is leaving the language without leaving it poorer, and a counter-jumper is not less contemptible than a clodhopper. The farmer of the day is the intellectual peer of the merchant, and the organisation of a modern farm demands qualities similar to those needed for the conduct of a modern business.

Mr. Frank Tate, formerly Director of Education in Victoria, is urging the establishment of a system of "regional" libraries. Regional libraries exist in England. They are libraries financed by the municipalities at small cost, and from them other and smaller libraries in country centres borrow books. Thus many libraries are supplied at a little more than the cost of one library. There is every reason to believe that the system would be a success in Australia. It is perhaps permissible to say here that we have a peculiar knowledge of the craving for good reading that exists in the country districts of Australia. Letters from readers of "The Australasian" tell of a desire for and an inability to obtain from libraries books which no public library in the world should lack—the works of Dickens and Thackeray among them. It is a crime against the community to leave such desire unsatisfied. The library in a Victorian mining village which sold its copy of the Encyclopaedia Britannica to buy a set of Edgar Wallace is a caterer to the taste of the village.

A public library to some extent must cater in order to exist; but its main purpose is to elevate, and its highest function is to advise and guide readers and to develop culture by providing opportunity. There is a wide field and one promising a rich yield. The people who with vision unobscured by masonry witness the daily miracle of sunrise and the brief beauty of sunset, who live in nearness to Nature, are in a peculiar sense susceptible to culture; they need it; many of them ardently desire it. . . . It is not suggested that the establishment of an efficient library system will result in the discovery of many village Hampdens or mute, inglorious Miltons, but one desirable and inevitable consequence would be the betterment, morally and intellectually, of the whole community.—"The Australasian."

The Great Point in Clean Milk Production.

Speaking at a meeting of farmers brought together under the auspices of the Rochdale Agricultural Discussion Society (England) to hear a talk by Dr. Innes, the Medical Officer of the borough, on milk in relation to health, Mr. G. B. Wells endorsed the doctor's statement that the great point in clean milk production was that the workers must be interested and understand the various operations. One inefficient person could upset all the team work. Sterilisation of vessels was also of great importance. The adaptation of the farm copper for this purpose would yield good results if attention could be given to each vessel, and they had sufficient enthusiasm to do the work conscientiously.

Empire Provender.

A special correspondent of the "Sydney Morning Herald," writing from London on 1st June, had this interesting note on the demand in the Old Country for Empire foodstuffs:—

Empire foodstuffs are no longer unfashionable in London, and even the smartest hotels are often gratified to serve them. Hard work by a handful of courageous pioneers and the example set by a group of persons of high degree have produced results that are most surprising. Ordinarily, one can mention Australian butter and even Australian wine, or Canadian fruits or New Zealand mutton, or (for that matter) South African melons without a blush in the most exclusive restaurants. But on an occasion such as Empire Day, one does so with positive pride.

Last Friday (which, of course, was Empire Day) more than 20,000 Empire meals, each course of which was composed wholly of British, dominion, and colonial products, were served in the West End hotels and restaurants. Australian and South African burgundies, clarets, and hocks were supplied in profusion with these repasts. Nigerian melons, grape-fruit, and peaches; Indian curries and turtle; Canadian sweet corn and ham; Kenya coffee; toheroa soup and a score of edibles from the counties of England figured on the menus. It was a day, in fact, on which a concerted and successful effort was made to bring to the notice of Londoners and overseas visitors the virtues of eating with a patriotic appetite.

Even at Claridges, the home of princes and millionaires, the Empire note was struck with a bang. "Many dominion dishes are now served here regularly," said a member of the managerial staff. "There is no longer any need to go outside of Britain or the Empire to meet the requirements of the most exacting epicure. This is due to the enterprise of growers and producers, and to improved cold storage facilities, which make it possible to bring tropical fruits and perishables long distances to London."

It is due, also, if one might say so, to the destruction of those snobbish barriers which for so many years obstructed the sale of Empire products except in the cheapest cafes and public-houses. The Empire wines, for instance, which were given special prominence on Friday, were all selected from existing lists. It is not so long ago since a request for a dominion wine would have produced a supercilious refusal from the very head waiters who now recommend it.

The Journal Appreciated.

A Fernlees farmer writes:—" . . . Allow me to congratulate you on such a helpful Journal for the man on the land. I have found many of your articles on Queensland grasses and pasture management very helpful. There is no doubt but that the future prosperity of the country is bound up in better management of our national resources."

Oldest Donkey Dead.

"Lassie," said to be the oldest donkey in Great Britain, was found dead recently, and was buried in the paddock where it had been kept for years.

"Lassie" was forty-seven years, and belonged to Miss Mabel Bruce, of Westmoreland road, Bromley, England, a daughter of the late Mr. Justice Bruce. Miss Bruce and her sister were on holiday, near Paisley, in 1888, and heard that a local farmer was trying to find a home for a crippled donkey born in a gypsy camp, and left behind by the gypsies. The two sisters accepted the donkey, and took it to Bromley.—"The Veterinary Record."

"Yellow" Meat.

Answering a correspondent in "Modern Meat Marketing" (March, 1935, p. 118), Colonel T. D. Young, Veterinary Adviser to the National Federation of Meat Traders Association, England, remarked:—

There are many sheep affected with jaundice which, on slaughter, show what is referred to as yellow mutton, but there are many yellow carcasses of mutton which are not affected with jaundice, the colour being hereditary. Such carcasses are quite sound and fit for human food. Feeding has been suggested as a cause for the yellow colour, but butchers may buy a score of sheep all having been grazed in the same field and one sheep, possibly, will be the only one showing a yellow colour on slaughter.

In jaundice all the tissues are yellow, while in hereditary coloured carcasses, the fat only is yellow—e.g., as in Channel Island cattle (Jerseys and Guernseys). In jaundice, the kidneys and liver are generally abnormally black and the mucous membranes very yellow. A chemical test for bilirubin is conclusive in a disputed case, but practical meat inspectors can generally decide without such a test.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

FOOD FOR THE WINTER.

HEALTHY active children are more hungry in cold weather and need rather more food, especially more butter and other fat, than in hot weather; but this does not mean that they can safely consume an unlimited quantity. If a child begins to lose appetite and condition, and at the same time to pass very pale or even putty-coloured motions, he is suffering from fat-indigestion, and all fat must at once be omitted from his food until he recovers. Then it should be gradually resumed, but not in such large quantity. Children differ in their tolerance for fat, but they should be allowed as much as agrees with them during the winter. One reason is that fat produces heat, but the more important reason is that certain fats, especially butter and cod liver oil, are the principal source of two of the vitamins so specially necessary for growing children.

Vitamin D.

One of these, vitamin D, is produced by sunlight acting on the skin. In winter there is less fear of exposure causing sunburn, but it is still necessary to be cautious with babies and young children, to accustom their skin to sunlight gradually, carefully regulating the time of exposure. In older children, who have not been habitually overclothed, there is not much need for caution. But it would be most unwise to rely altogether on sunlight for this vitamin.

Vitamin A.

This is not all. Another vitamin, known as A, is a very important factor in the resistance to those infections, to which children are specially exposed in winter months. Therefore their diet should include foods rich in vitamins A and D. These are butter, cream, and eggs. There are few children who would not be the better for one egg every day. If you cannot afford this, scramble the eggs or make them into custard so that each child may have his portion.

Cod Liver Oil.

These foods are sufficient for most children, but some are not able to take enough of them. Therefore, all babies not breast fed and all children who are delicate should be given cod liver oil right through the winter. Some take the pure oil readily, but for many it is best given in the form of an emulsion, which should contain 50 per cent. of the oil.

Food not Medicine.

It must be clearly understood that we recommend cod liver oil as a food and not in any way as a medicine. We have nothing to do with

the advising of drugs or medicines. Our province is promotion of good nutrition and sound health by natural simple means.

It must not be thought that giving cod liver oil will make up for all the deficiencies of a child's diet. It certainly will not do this. All children under six years of age should take one pint of milk daily in various ways, and if the mother cannot afford to give so much to her older children, half-a-pint is the smallest quantity that can be recommended.

Vitamin C.

This vitamin is absolutely necessary for health. It is most abundant in uncooked fruit and raw lettuce. For most dwellers in this happy land tomatoes, oranges, pineapples, or other fruits are abundant right through the winter. Those who live in our sorely stricken West can obtain vitamin C by sprouting their peas and beans before eating them.

Vitamin B.

There is yet another vitamin which is dangerously deficient in ordinary diets. It is known as vitamin B, and is abundantly present in whole cereals, but totally absent in white bread and white flour. A valuable source of this vitamin is porridge made of whole wheatmeal, which is cheap and easily procurable. Oatmeal is more frequently used, but we believe it is not quite as good. Some like a mixture of both. Avoid all fancy breakfast foods, which are a silly fashion. Most of them contain little or no vitamin, and all are more expensive than their food value warrants.

Unless a large portion of porridge is eaten, something more is necessary. Brown bread is better than white bread, but it is not the same thing as wholemeal bread. This some find it hard to get, and all is not wholemeal bread that is called by this name. Therefore, we advise that each child should take daily a heaped dessertspoonful of cooking-bran. This is very cheap, for it can be bought for one penny a pound in Brisbane, and is so light that a pound goes a long way. It may be eaten mixed with a little milk, in porridge or soup, or some of it may be made into scones, and it should always be added to milk puddings.

We hope many Queensland mothers will take our advice, and that many children will enjoy a more healthy winter than they did last year.

IN THE FARM KITCHEN.

VALUE OF PINEAPPLE DIET.

Few people now dispute the fact that fruit is essential to health. Medical research has abundantly proved that many cases of malnutrition, particularly in the country districts of Australia, are caused by the absence of fruit from the daily diet. Digestive disturbances leading to disordered blood conditions are common symptoms of this deficiency, and local medical men are strongly urging the greater use of fruit. All fruits supply juices that aid digestion and help to keep the intestines free from harmful bacteria, contain vitamins, minerals and easily-digested energy sugars. But it is in our tropical fruits that Nature's medicines are most lavishly stored, and pineapples grown on warm hillsides continuously bathed in tropic sunshine, seem to have absorbed a full measure of the healthful properties contained in the life-giving rays of the sun.

The body cannot store some of the health factors required by it—they must be replaced every day, and this is why the pineapple should be a daily article of diet in every household. Two slices a day, fresh or canned, are all that is necessary. When the fresh fruit is plentiful—usually in the months of February, March, April

and July, August, September, October—and if distance does not prevent your purchasing, buy the fresh fruit. For the rest of the year purchase canned pineapple. Do the same all the year round if transport makes it impossible for you to procure the fresh fruit.

Natural Properties Retained in Canning.

Remember, fresh or canned, all the health benefits of pineapples are intact. Sir Wm. Arbuthnot Lane, one of London's leading dietetic authorities, after exhaustive inquiries relating to the properties of canned fruits, said no considerable proportion of the mineral salts is exhausted; the juice has definite nutritive value, the vitamins are, in most cases, left intact, and in some cases actually intensified.

Pineapples are undoubtedly one of nature's health correctives and healers. Their richness in vitamin A helps to prevent common colds and those eye ailments so prevalent amongst children, particularly in the inland districts of Australia. At the first sign of a cold or when colds are prevalent eat pineapples freely. Being rich in vitamin B they promote body growth. Owing to their vitamin C content pineapples are recommended by doctors as a precaution against pyorrhoea which, according to the "Medical Press and Circular," is largely a dietary affection.

Dr. J. R. Killian, a distinguished American scientist specilising in the study of nutrition, states that the fight against pyorrhoea and dental decay will be helped in the future by a liberal use of pineapple in the diet.

Pineapples are of great value in after treatment following tonsil removals and assist the stumps to heal. The pure juice is a proved reliable ferment for dissolving necrosed tissue in quinsy.

These benefits are available to all, as where the fresh fruit is unobtainable the canned pineapple—retaining as it does the properties of the freshly-picked fruit—may be used.

Its uses in the kitchen are legion. Slices fresh or canned, served with cold meat have an appeal which ensures their continued use, particularly with corned meat. To the busy housewife the pineapple presents an easy solution of the ever-present dessert problem. No dish is more quickly prepared or more appetising than grated pineapple, fresh or canned. Its popularity never wanes.

A fruit salad can be rapidly made by the use of pineapple, fresh or canned, and one or more of any fruits in season. For cooked desserts the pineapple may be served in a multiplicity of ways, and the following receipes are recommended:—

Pineapple Jelly.

Wash a good half-breakfastcupful of sago, put in a large jug with half-cupful water, 1 cupful sugar, 2 grated pineapples, and juice of 1 lemon. Put the jug in a pan of boiling water and stir until clear, then put in moulds until cold. Serve with custard or grated pineapple.

Pineapple Fritters.

Put flour in basin, add pinch of salt, baking soda, and cream of tartar, the usual quantities to each pound of flour, 1 tablespoonful sugar, and 1 egg to each pound of flour. Mix all together with milk, or half milk and half water, to a nice batter, dip in pieces of pineapple, and fry to a nice brown. Condensed milk may be used if fresh is not available for the batter, by mixing at the rate of 1 tablespoonful to a pint of cold water. This mixture of batter may be used for bananas, mangoes, or apples, or any fruit that is used for fritters.

Pineapple Pie.

Two cupfuls grated pineapple, 1 cupful water, 1 cupful sugar, 2 tablespoonfuls breadcrumbs. Line pie-dish with paste, mix pineapple, water, sugar, breadcrumbs, and yolks of 2 eggs, bake, and when cool beat up the white of eggs and put over pie.

Pineapple Turnovers.

Make a flaky pastry from 2 cups self-raising flour and half-cup dripping. Cut out shapes the size of a tea plate, put a spoonful of chopped pineapple and a little sugar on each fold, press over the edges of the pastry together, and bake in a brisk oven. The turnovers are better served with hot custard.

A delicious pineapple drink may be made in either of the following ways:—

Pineapple Syrup.

Keep the skins of your pineapples and boil slowly and well in plenty of water. Strain through cloth and add sugar to taste. This makes a delicious drink, and retains all the medicinal qualities of the pineapple.

Pineapple Water.

Peel a medium-sized pineapple and cut it into pieces, pound it to a pulp, and mix with it 1 pint of boiling syrup and the juice of 1 lemon, and let it all stand covered for two hours; now strain, and add 1 quart of water, and ice.

THE VALUE OF VINEGAR.

Every housewife has a bottle of vinegar in her store cupboard, and here are some ways of using it.

When boiling a fowl add a spoonful of vinegar to the water in the saucepan, and it will help to make the bird tender.

Do the same when boiling fish, and it will keep it white. Old potatoes, also, can be kept white by this means.

When put with rice, it keeps the grains separate. This is a good tip when boiling rice for curry.

In hot weather, if the joint does not look very fresh on arrival from the butcher, wash it all over with equal parts of vinegar and water, and then wrap it in a clean piece of muslin or old curtain wrung out in a solution of the same strength. Always hang the joint when possible, so that the air can get all round it.

If you think the joint will be tough when cooked, rub it with vinegar and let it stand an hour or two before cooking. It will help to make it tender.

If vinegar is used instead of water in mixing mustard it will keep fresh much longer and also improve the flavour of the condiment. If the flavour is too strong use half vinegar and half water in the mixing.

For toilet use, vinegar is equally beneficial. A cupful added to the bath will be found most refreshing, while the same amount in a foot bath of hot water will ease aching feet in a wonderful manner.

As a gargle, use vinegar, a tablespoonful in a glass of water. It relieves sore throats and acts as an antiseptic.

After washing the hair, rinse with warm water and a little vinegar. This removes all stickness and makes the hair soft and silky.

HOUSEHOLD USES.

It is helpful, too, in many household tasks.

If a few drops are added to a tin of blacklead, the blacklead will not dry up.

Windows rubbed with a cloth dipped in vinegar will take a brilliant polish.

For cleaning water bottles, take one part of salt to two of vinegar, put into the bottle and shake well, then leave to stand for a few hours. Give a final shake, and rinse in clean water.

Sponges which have become slimy should be soaked for several hours in a fairly strong solution of vinegar and water, and then rinsed thoroughly in two of three changes of water. They will then be like new.

If your polished mahogany table gets badly smeared and spotted, a little vinegar will remove the marks. Use an old table napkin and rub with equal parts of vinegar and water. Rub dry, and polish in the usual way, and your table will be wonderfully shiny again.

KITCHEN GARDEN.

Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough until required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. When the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected plenty of hoeing and

watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower and take up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

The continued production of rhubarb may be greatly assisted by giving a heavy mulching of manure and hoeing it well into the soil. Keep the beds well watered, and give regularly a dressing of liquid manure, say, once a week.

It is not necessary to use forcing manures on the young stock, as plants are ruined if forced in the early stages of growth.

The rhubarb makes rapid growth during the autumn and spring, and when stalk cutting has been started liquid manuring and manuring may be given.

NOTES ON ROSE CULTURE.

The following notes on rose culture are taken from the Pacific Nurseries Catalogue (Messrs C. W. and A. C. Heers), Manly, Brisbane:—

Time for Planting.—From May until the end of September. For the coastal, excepting perhaps the Central and North, we specially recommend the later period, and, in support, advance the following reasons:—

Every horticulturist must admit that all roses, particularly in the coastal area of Queensland, invariably exhibit luxurious and succulent growth and wealth of bloom during the months of March, April, May, and early June. This being so, we contend that as the plants are full of flowing sap they are not in a fit condition for transplanting during that period. There are, however, odd seasons when plants ripen earlier. In such circumstances, we would not object to extra early planting, but consider May and June do not give the plants time to establish themselves sufficiently to withstand the approaching winter.

Roses planted during the earlier months readily respond to the warm periods which assuredly occur in the middle of our winter, only to be as surely struck by our colder and more frosty days during the latter part of the winter. This shock not only checks the growth, but actually kills the tender white jelly-like roots then in the forming. There can be only one result—a plant with stunted growth upon which the foundations of your future tree has to be built. Remember, if these plants are left undisturbed in the nursery they remain dormant.

On the other hand a thoroughly rested and ripened plant, transplanted during late July, August, or September, according to the trend of the season, is ready to break away into full and vigorous growth as the warmth of Spring appears, never to look back.

We readily admit that the rose, being a hardy plant, may even do well when planted early, but after much experience we prefer to pin our faith to late planting, in most parts of Queensland where our winter is so variable. Holding these views, we hope clients will follow our advice and plant late in the season, say, from the middle of July to the middle of September. However, from Rockhampton north, earlier planting may be preferable.

Roses planted during September and even October will do quite well; if planted this late they should, however, be provided with artificial shade and kept well watered until they are established.

It is gratifying to us to know that quite a number of clients, after acting upon our advice, write to say how pleased they are with their experience of late planting; so we reiterate—do not plant or prune roses too early in Queensland, especially along eastern slopes south of Bundaberg.

We must warn people that early planting is the cause of many failures, therefore, do not complain if you ignore our advice.

Selecting Varieties.—When making selections consult our brief descriptions and ascertain the variety's suitableness regarding its growth, style, colour, fragrance, and freedom of bloom. If you are not acquainted with the various varieties listed it will pay you to leave selection to us, mentioning any varieties you may already have. You will find a special list on the inside of the front cover, giving our choice in each colour.

Planting.—Roses should never be planted when the ground is sodden, as the soil glues together and excludes the air so necessary for the future welfare of the plant. Rather delay planting, and in the meantime bury the whole plant lengthwise,

cover completely with soil and await more favourable conditions. It is surprising how long plants may be kept by this method.

Although roses do well under almost any condition, it will always repay you to trench and drain the ground. However, should the ground be flat and unsuitable for drainage, it is better to dig it a foot deep and raise the bed. Such beds require hardwood or concrete borders, otherwise the outside plants dry out too easily. Work in a liberal supply of well-rotted cow or stable manure. This work should be done at least four weeks prior to planting. Plant so that the union will be just under the surface of the ground. In the case of light sandy soil it is an advantage to have the union as much as 2 inches below the surface. Never, on any account, place fresh manure or any form of fertilizer near the roots at the time of planting.

The roots should be evenly spread and so arranged as to give them a downward tendency; cover with about 3 inches of fine soil and press down firmly; fill in and give a liberal supply of clean water. Keep the earth away from the graft until the plant strikes; in the meantime, mulch with straw in order to protect union and keep the soil from caking. Cover the outside edges of straw with soil to keep it in position.

The mulch also creates an ideal condition for further waterings. Should the weather continue dry, it will be necessary to water at intervals, according to the conditions. Do not use fresh manure or artificial fertiliser near the roots when planting. Should the sun's rays become hot after planting, it is advisable to provide the plant with artificial shade.

Suckers.—Always keep a sharp lookout for brier suckers, which may from time to time sprout from below the graft. These are readily detected by their foliage, and if not removed they will in time kill the rose tree. *However, on no account must any new rose growth from the base be interfered with.*

Manuring.—Roses should be heavily manured at least once a year, well-rotted animal manure being the best. It should be spread over the bed and lightly forked in. Bone dust and other suitable fertilizers are also beneficial. Established rose trees are greedy feeders, and periodical light dressings of fertilizer, applied during damp weather, will give good results. Heavy soil needs occasional dressings of lime, which, however, should not be used within a month or so of fertilizers.

Pruning.—There is no phase of rose culture more difficult to impart than that of pruning. After accepting the broad principles generally laid down, make a close study of the habits and peculiarities of the various types of roses. Apply commonsense methods and observe and profit by the results obtained. We are opposed to early pruning in this State for similar reasons to those advanced against early planting. However, varieties with H.P. strain may, if the canes are sufficiently ripened, be shortened during March or April to from 3 to 5 feet from the ground—the weaker the shorter. This will ensure a wealth of bloom in the late autumn. For the annual overhaul the end of July and August is the best time. Hard pruning, as practised in cold countries, must not be generally applied here. The reason is not far to seek, as the periods of inactivity are short and uncertain. Make the prevailing conditions your guide as to how and when to prune. Assist the pruning problem by observing the following golden rules during the entire season:—

(1) Cut away dead, spindle wood; (2) always cut blooms and stems that have bloomed well back to a strong eye; (3) never allow seed pods to form on the bush. By these means you will encourage correct growth and freedom of bloom. There are odd varieties which resent the knife, Penelope for instance.

It is most important that plants be kept free from scale and other diseases, otherwise valuable portions have to be prematurely removed to the detriment of the plant. Exhibitors should prune harder than those growing for general purposes. Tea roses require lighter treatment than H.T.'s and H.P.'s.

To prune, cut away all dead, diseased, and spindling wood; thin out anything that is liable to crowd; cut back shoots to a strong eye, pointing outward in the case of uprights and inward on those of spreading habits; preserve any new strong shoots coming from the base (often misnamed water shoots) that may serve to replace any worn-out stems that should be renewed every three years or so.

As soon as the new growth appears, carefully rub off any shoot that is likely to overcrowd or grow in a wrong direction.

Climbers should be allowed their fling during the time they are establishing themselves. Train the strongest canes horizontally, about 24 inches apart, shorten the ends, and cut away all other wood. Provide for the renewal of these trailers every few years.

Aphis.—Nicotine sprays, such as Black Leaf Forty, are most effective. They may be kept in check by applying the hose freely.

Scale.—Spray with either red oil, kerosene emulsion, or any lime-sulphur mixture. Many roses are lost annually through scale.

Grubs, &c.—For all leaf, plant, and flower eating insects, spray with arsenate of lead as directed.

Mildew.—This is a stubborn fungus disease that has for many years past baffled our scientists. The rose, like all other life, no doubt requires a properly balanced food, and as analyses show that our soils are often deficient in potash and lime, it is not altogether surprising to find that, where good dressings of wood ashes have been applied, appreciable improvement in reducing the mildew scourge is apparent. Experiments are being conducted all over the world in search for a cure for mildew, and reports to hand show that potash used in its various forms gives results which are at least reassuring. For our part we can say that we have found the use of wood ashes, also spent carbide, beneficial. If these are not available, try giving each established tree say 4 to 6 oz. of sulphate of potash, in addition to lime, and observe the result.

Regular sprayings with liver of sulphur (1 oz. to 2 gallons of water), or 1 oz. bicarbonate of soda to 1 gallon of water, or Bordeaux, will ward off attacks. Remedies: Flowers of sulphur, 9 parts; arsenate of lead, 1 part; well mixed; applied with a bellows when the dew is on the foliage. Sprays: Sulphuric acid, 1 part to 800 parts of rain water, 1 oz. bicarbonate of soda to 1 gallon of rain water is a helpful spray. A drastic remedy is 2 tablespoonfuls of lysol to 1 gallon of water. Spraying should be done before noon. Always treat the underneath as well as the top of the foliage.

Failures.—Failures are generally attributable to one or more of the following causes:—

Having used fresh manures or fertilizer at time of planting. Allowing roots to be exposed after unwrapping. Lack of drainage or planting in soggy ground through excessive wet weather. Planting too near the edge of raised beds, too near shrubs, trees, and/or hedges; also in shady positions. Allowing plants to dry out after westerlies. Giving too much water during first fourteen days in cold weather. Heavy frosts just after planting or even when the plant is established. Planting too deep, planting too shallow, or planting too loose. Acidity in damp or poorly prepared soils. Chemical reactions from fertilizers previously applied to the soil. Plants being knocked by children or the thoughtless gardener. Dogs and cats are often the cause of plants dying or being damaged. The use of strong soap suds, &c. Planting too early or too late. Planting in same spot where a rose has been growing unless soil has been replaced.

TOMATO SEED SELECTION.

In selecting tomatoes from which seed is to be saved, only that from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit, should be chosen. Several fruit should be cut open to be sure of the quality. A plant should be chosen that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Care should be taken to see that the plant is free from disease, as several tomato diseases are transmitted by the seeds.

The best method of separating tomato seed from the surrounding pulp is as follows:—Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full, fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

As already indicated, selection from a plant which is free from disease is important, but as a further precaution the seeds should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water, before planting. Proper precautions must be taken with mercuric chloride where there are children or animals, as it is highly poisonous if taken internally.

TREES—THEIR VALUE TO A TOWN.

Dr. C. E. W. Bean, writing in the "Sydney Morning Herald," has this to say of trees and their value to a town:—

When some dreary township or metropolitan suburbs, seen from the railway, strikes you as a wretched, depressing place to live in, and presently some other town or suburb impresses you as a pleasant region, have you ever asked yourself what it is that makes the difference? If not, make a test in future, and in two cases out of three you will probably find that the chief difference lies simply in the presence or absence of trees. . . .

What can be done, chiefly by the efforts of a single public-spirited leader, can be seen by anyone who visits the beautiful city of Bathurst. Fifty years ago Bathurst was almost as large a town as it is to-day, with some rather fine public buildings, erected largely at Government expense. But in spite of them it was as ugly, drab, sprawling a place as are many of our country towns and suburbs.

A City of Trees.

But the then Mayor of Bathurst, Dr. T. A. Machattie, was a man of exceptional public spirit, foresight, and energy. When he expressed his belief that the wide empty streets of the bare, sunbaked town could be beautifully and usefully transformed by planting trees, he found most of the citizens apathetic, and some opposed on the ground that the trees would restrict the traffic. Seeing that in those sleepy days it was almost an "incident" if a dog walked across the road, and that of all places in the world the Australian country town was most likely to benefit by shade and beauty, the good doctor was not deterred. Eventually he created some public interest in the project by getting a holiday for the school children to see and help in the planting; and so the streets of Bathurst were in a few years lined with young trees. Further, the gaol was removed beyond the outskirts of the town, and the old gaol pulled down, and its grounds turned into a park (which the aldermen named after their mayor—Machattie Park), and planted with trees.

Of how an unattractive town may be transformed into a shady, beautiful resort simply by tree-planting, Bathurst is perhaps the best example. But Grafton, Albury, Orange, Tumut, and many other towns are also striking examples of this truth; and fortunately not only civic authorities, but private landowners, are becoming aware of it. A beautiful tree, or a background of them, gives not only shade and shelter, but beauty and distinction to the most unattractive cottage. So much is this recognised in some countries that when land is subdivided for building, a covenant is sometimes inserted insisting that trees must be left.

The farms of New South Wales are seldom beautified by trees to the same extent as those in other countries, or as those in Victoria and South Australia, where avenues of sugar gums are often seen lining the home paddock or the approach to the homestead. Australians who fought in the Somme country in France will remember that almost every farm there had its grove of trees, and the villages seen from a distance resembled woods. Yet of all homes the farm is most easily made beautiful with trees, since they may grow without fear from those public officials who, in the past, have been the greatest enemies of the street or garden tree—the electric lighting and postal authorities.

Trees on Our Roads.

Happily of late the attitude of these and other officials towards tree-growing has undergone an almost complete change, and many departmental engineers are now as keen as the artist and the architect to preserve the trees they used to destroy. The Main Roads Board is a leader in the movement, and the Government has lately given a fine example in the great care taken to preserve the trees and brush along the Oxley Highway in the north-east of New South Wales. And the great tree-planting by which this jubilee has been commemorated surely means that we are now well set upon the right road.

By tree-planting alone we could within a generation transform most of the ugliness of our towns and homes into real beauty; and all citizens may help towards this end by urging upon their local council, or the other authorities concerned, the support and continuation of that effort to end in the covering of our bare suburbs and townships behind screens of shady foliage; and by themselves keeping or planting garden trees where they suitably can; and by resisting all unnecessary tree-cutting as a policy of backwardness and ignorance.

What Dr. Bean says about the beautification of country towns in New South Wales applies with equal force to Queensland. Fortunately, we, too, have some notable examples of the fine public spirit which he extols. Toowoomba provides an outstanding example that might well be followed by lesser towns and villages.

Orchard Notes for August.

THE COASTAL DISTRICTS.

THE bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy, a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches, with consequent over-production and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot, and in the North Coast district particularly, for the presence of the citrus root bark channeller which may attack the roots for a distance of several feet from the base of the trunk of the tree. A very light application of paradichlorobenzene, buried a few inches under the soil in circles around the tree and the surface stamped firm, is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches, and care should be taken to ensure that the crystals of paradichlorobenzene do not come into actual contact with the roots. It may be necessary to repeat the application at three to four weeks' intervals.

In those orchards where it is necessary to take precautions for the control of black spot, melanose, or scab, it should be remembered that it is essential that the fungicide be used at the correct time. In the case of the first two diseases mentioned, Bordeaux mixture of 3-2-40 strength, to which 1 per cent. of well-emulsified red oil has been added as a spreader, should be applied when the greater part of the blossom has fallen. In the case of scab the same spray should be applied somewhat earlier, that is, when about half the petals have fallen. Recent experiments have indicated that home-made colloidal copper used at the rate of 1 in 13 of water will prove an effective substitute for Bordeaux mixture on citrus, and possesses the advantage that it does not lead to an increase in scale insects. The latter sometimes increase rapidly after Bordeaux has been used, which necessitates special precautions being taken for their control.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected "arms" of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 feet according to the size of the tree, will form the future head of the tree, and from these numerous shoots will originate; these shoots in turn are reduced according to circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertilizer, not just around the trees beneath the branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked

sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertilizer or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The attention of citrus growers should be confined mainly to good varieties like Joppo, Siletta, and late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour; also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lie about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internote to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock.

Farm Notes for August.

THE most important work during August will be the preparation of the land for all spring-sown crops. The better the cultivation the better the results that can be expected. Potato planting will be in full swing this month, and in connection with this crop the prevention of diseases calls for special attention. Where possible, seed potatoes should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. However, if only large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slaked lime or wood ashes as soon as possible after cutting. If considered necessary to prevent possible infection by scab, potatoes should be treated with hot formalin or acid corrosive sublimate. Details of the method employed may be obtained from the Department. When treatment has not been carried out prior to sprouting it should be delayed until a day or so before planting. Where cut tubers are to be sown, they should be dipped before cutting.

In localities where all danger from frosts is over, sweet potato cuttings may be planted out. This crop deserves more attention owing to its value for both culinary and stock food purposes.

Arrowroot may also be planted this month in suitable localities.

With the advent of warmer weather weed growth will increase, and cultivators will be kept busy in growing crops, and land being prepared for sorghums, millets, maize, cotton, and summer growing crops generally.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. May.	Average Rainfall. No. of Years' Records.	Total Rainfall. May. 1935.	Total Rainfall. May. 1934.
North Coast.	In.		In.	In.
Atherton	2·16	34	5·07	4·19
Cairns	4·50	53	7·52	4·85
Cardwell	3.62	63	1·99	4·06
Cooktown	2·83	59	3·53	2·85
Herberton	1·70	49	4·40	2·66
Ingham	3·64	43	5·69	4·20
Innisfail	12·50	54	14·88	26·34
Mossman Mill	3·77	22	7·67	2·96
Townsville	1·28	64	2·37	0·24
Central Coast.				
Ayr	1·13	48	1·73	0·80
Bowen	1·30	64	1·82	0·37
Charters Towers	0·79	53	1·07	0·97
Mackay	3·71	64	10·80	3·74
Proserpine	4·36	32	5 87	5·39
St. Lawrence	1·77	64	1·03	1·95
South Coast.				
Biggenden	1·68	36	2·55	1·61
Bundaberg	2·59	52	2·31	1·08
Brisbane	2·76	84	1·55	2·39
Caboolture	2·81	48	1·28	2·89
Childers	2·08	40	2·82	1·92
Crohamhurst	4·85	42	2·88	5·89
Esk	1·94	48	1·33	2·10
Gayndah	1·56	64	1.65	2·41
Gympie	2·81	65	2·36	2·18
Kilkivan	1·81	56	1·68	1·92
Maryborough	2·99	64	2·54	3·21
Nambour	4·71	39	2·80	7·63
Nanango	1·52	53	1·37	2·93
Rockhampton	1·63	64	1·09	0·82
Woodford	2·87	48	1·65	3·94

Divisions and Stations.	Average Rainfall. May.	Average Rainfall. No. of Years' Records.	Total Rainfall. May. 1935.	Total Rainfall. May. 1934.
Central Highlands.	In.		In.	In.
Clermont	1·29	64	0·15	2·12
Gindie	0·90	36	..	0·68
Springsure	1·25	66	..	1·08
Darling Downs.				
Dalby	1·30	65	1·81	3·06
Emu Vale	1·15	39	1·10	0·37
Hermitage	1·17	29	..	0·12
Jimbour	1·21	47	1·81	2·95
Miles	1·49	50	0·81	3·16
Stanthorpe	1·84	62	1·03	0·28
Toowoomba	2·16	63	1·73	2·34
Warwick	1·52	70	0·95	0·15
Maranoa.				
Roma	1·40	61	..	0·77
State Farms, &c.				
Bungeworgorai	0.89	21	0·08	0·61
Gatton College	1·51	36	5·13	1·30
Kairi	2·06	21	..	3·21
Mackay Sugar Experiment Station	3·23	38	8·36	3·24

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MAY, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Extremes. Date.	Extremes. Min.	Extremes. Date.	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·94	81	66	86	2	54	26	353	14
Herberton	..	72	54	79	1	43	27, 28	440	11
Rockhampton	30·06	80	57	87	12	42	15	109	1
Brisbane	30·14	74	53	78	11	43	31	155	5
Darling Downs.									
Dalby	30·14	73	42	79	11	33	18, 31	181	6
Stanthorpe	..	67	34	73	11	20	17	103	6
Toowoomba	..	68	44	75	11	35	14, 17, 18	173	5
Mid-Interior.									
Georgetown	29·97	86	59	92	2, 3	47	28, 29	1	1
Longreach	30·08	82	50	89	11	42	28	..	..
Mitchell	30·15	74	37	82	10	29	15, 30	5	2
Western.									
Burketown	29·99	85	62	91	3, 12	55	16, 27, 28	29	2
Boulia	30·00	79	48	89	9, 10, 11	41	27, 28	..	..
Thargomindah	30·15	72	45	82	9	37	30	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July. 1935.		August. 1935.		MOONRISE. July. 1935.	MOONRISE. Aug., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·46	5·4	6·36	5·20	6·52	7·23
2	6·46	5·4	6·35	5·20	7·38	7·51
3	6·46	5·5	6·35	5·21	8·17	8·20
4	6·46	5·5	6·34	5·21	8·50	8·48
5	6·46	5·6	6·33	5·22	9·22	9·17
6	6·46	5·6	6·33	5·22	9·50	9·51
7	6·46	5·7	6·32	5·23	10·20	10·24
8	6·45	5·7	6·32	5·24	10·48	11·4
9	6·45	5·8	6·31	5·24	11·18	11·52
						p.m.
10	6·45	5·8	6·30	5·25	11·53	12·47
					p.m.	
11	6·45	5·9	6·29	5·25	12·28	1·46
12	6·45	5·9	6·28	5·26	1·13	2·50
13	6·45	5·10	6·27	5·26	2·6	4·1
14	6·45	5·10	6·26	5·27	3·4	5·11
15	6·44	5·11	6·25	5·27	4·6	6·22
16	6·44	5·11	6·24	5·28	5·15	7·29
17	6·44	5·12	6·24	5·29	6·26	8·34
18	6·44	5·12	6·23	5·29	7·34	7·42
19	6·44	5·13	6·23	5·30	8·41	10·48
20	6·43	5·13	6·21	5·31	9·45	11·53
21	6·43	5·14	6·20	5·31	10·48	a.m.
22	6·43	5·14	6·19	5·32	11·53	12·54
23	6·42	5·15	6·18	5·32	a.m.	1·52
24	6·42	5·15	6·17	5·33	12·57	2·45
25	6·41	5·16	6·16	5·33	2·1	3·34
26	6·41	5·16	6·15	5·34	3·0	4·17
27	6·40	5·17	6·14	5·34	3·57	4·52
28	6·40	5·17	6·13	5·35	4.48	5·25
29	6·39	5·18	6·12	5·35	5·36	5·56
30	6·39	5·18	6·11	5·36	6·16	6·25
31	6·38	5·19	6·10	5·36	6·52	6·53

Phases of the Moon, Occultations, &c.

9 July	☾	First Quarter	8 28 a.m.
16 ,,	○	Full Moon	3 0 p.m.
23 ,,	☽	Last Quarter	5 42 a.m.
30 ,,	●	New Moon	7 32 p.m.

Apogee, 6th July, at 1.0 p.m.
Perigee, 18th July, at 12.42 p.m.

A total eclipse of the Moon will occur between 1 and 4 p.m. on July 16, but the Moon, being on the opposite side of the Earth to the Sun, will be below our horizon, rising only when the Sun sets.

At 11 p.m. on the 19th, the Moon will be passing Saturn 6 degrees north of it, and having risen at 8.41 p.m., will be well up in the north-east by east about 25 degrees further north than the zenith at Warwick.

Venus and Neptune will be apparently within 3 degrees of one another on the 25th at 4 p.m. They will be high up north-west by north, Neptune, having Declination 7.38 north, will be nearly 36 degrees from the zenith at Warwick, the Declination of Venus being only 5.9 north, it will be 2½ degrees higher up. Optical aid will generally be required, but keen eyes may detect Venus after its position has been fairly gauged.

Mercury will be little more than half a degree north of the Moon when they set 58 minutes before the Sun on the 29th. The nearness of the Sun will preclude any observation of this phenomenon by ordinary observers.

A partial eclipse of the Sun will occur on the 30th after it has set at Brisbane.

Mercury rises at 5.41 a.m. (1 hour 5 minutes before the Sun) on the 1st; on the 15th it rises at 5.13 a.m., 1 hour 31 minutes before it.

Venus rises at 9.38 a.m., and sets at 8.32 p.m. (3 hours 28 minutes after the Sun) on the 1st; on the 15th, it rises at 9.15 a.m., and sets at 8.36 p.m. (3 hours 25 minutes after the Sun).

Mars rises at 12.3 p.m., and sets at 12.33 a.m. on the 1st; on the 15th, it rises at 11.26 a.m., and sets at 12.7 a.m.

Jupiter rises at 1.31 p.m., and sets at 2.39 a.m. on the 1st; on the 15th, it rises at 12.35 p.m., and sets at 1.44 a.m.

Saturn rises at 9.48 p.m., and sets at 10.28 a.m. on the 1st; on the 15th, it rises at 8.50 p.m., and sets at 9.35 a.m.

The Southern Cross will be at its highest point, represented by XII. on the clock face at 6 p.m. on the 1st, and 5 p.m. on the 15th. It will then be 57½ degrees above the horizon at Brisbane, 53½ degrees at Rockhampton, 49 degrees at Townsville, and 46½ degrees at Cairns, where 18 minutes must be added to the times for greatest altitude.

7 Aug.	☾	First Quarter	11 23 p.m.
14 ,,	○	Full Moon	10 43 p.m.
21 ,,	☽	Last Quarter	1 17 p.m.
29 ,,	●	New Moon	11 0 a.m.

Apogee, 3rd August, at 4.6 a.m.
Perigee, 15th August, at 6.6 p.m.
Apogee, 30th August, at 12.18 p.m.

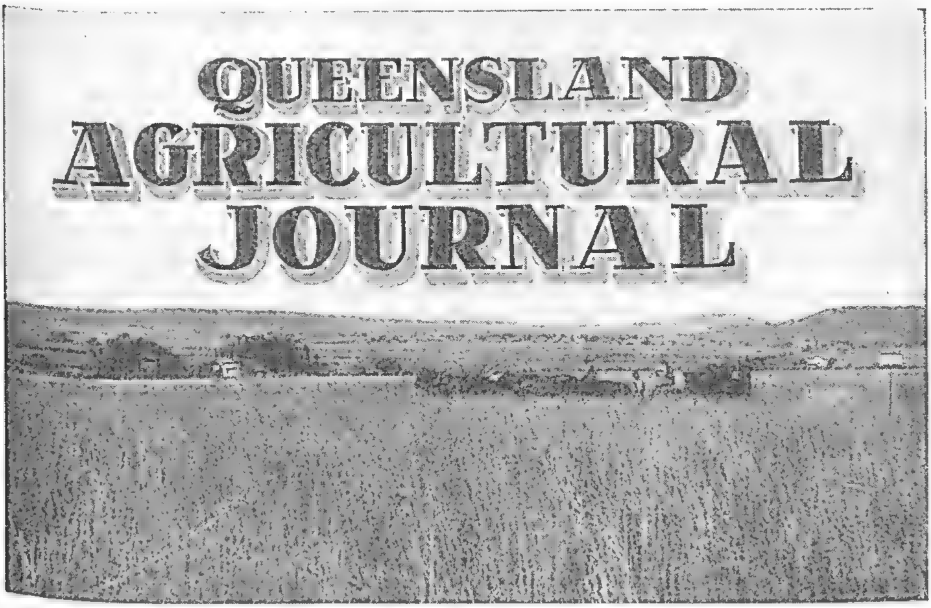
For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



VOL. XLIV. 1 AUGUST, 1935. PART 2

Event and Comment.

Sugar Scientists in Brisbane—First World Conference in Queensland.

THE International Society of Sugar Cane Technologists will commence its fourth triennial conference at Brisbane, on Tuesday, 27th August. The conference will be the first meeting of that important body in any country of the British Empire, and the first world congress of any kind to be held in Queensland. Plans are now complete for what should be a highly successful gathering, from which great and lasting benefit to the Australian sugar industry is expected to accrue. The Society, a very active and influential body, was an outcome of the Pan-Pacific Conference at Honolulu in 1924. Since then its triennial conventions have been held at Cuba, Java, and Porto Rico. The choice of Brisbane as the venue of an international conference so early in the history of the society is regarded as a distinct compliment to Queensland and a definite recognition of the high standard of technical efficiency attained by the Australian sugar industry. This is especially so when we consider that our production amounts to only 2 per cent. of the world's aggregate output of cane and beet sugar combined, and only 3 per cent. of the world's cane sugar total. The distinction bestowed on Queensland is, therefore, obvious, and it is appreciated fully by all concerned, including the State Government, which will supply a special

train to convey the overseas delegates on a tour through the sugar districts at the conclusion of the conference. The tour will commence on 4th September, and the first halt will be at Bundaberg. In the surrounding district the visiting scientists will see cane growing under subtropical conditions. Bingera mill and plantation, Fairymead, Millaquin, and the local experiment station have been listed in the itinerary. Sarina will be the place of an extended stay, and there the Plane Creek mill and the power alcohol factory will be the chief centres of interest. A week-end will be spent in the Mackay district. From there the special train will go on to Ayr, where the visitors will be shown modern milling plants in operation, the fertile lands of the Burdekin Delta, and the remarkable irrigation system by which they are watered. From Ayr the train will proceed to Ingham for an inspection of the two C.S.R. Company's mills, Macknade and Victoria. Afterwards, the party will be taken by launch through the Hinchinbrook Passage to Cardwell, the train going on to that port in the meantime. Tully district, where Queensland's largest sugar mill is situated, will next claim the attention of the tourists. From there they will go on to Innisfail, viewing the richly-dowered Johnstone River country en route. Cairns will be the base for further excursions to the Babinda, Hambledon, Mulgrave, and Mossman mills, as well as to the experiment stations that serve the needs of the far northern areas. Atherton Tableland and its wealth of scenic beauty and a subsequent brief voyage to the Barrier Reef will provide the something different so necessary for the success of such a tour. The special train will leave Cairns on 17th September on its return to Brisbane, where it will arrive at 9 a.m. on Thursday, 19th September.

The conference will be opened officially on Tuesday, 27th August, by the Governor, Sir Leslie Wilson, and will be preceded by a civic reception by the Lord Mayor of Brisbane. Many notable representatives whose names are known throughout the sugar world will be present, and the countries that will be represented include Great Britain, the United States, South Africa, British West Indies, India, Holland, Java, the Phillippines, and Hawaii.

The visit of some of the leading authorities on sugar production and manufacture will obviously be of immense benefit to Queensland sugar technologists, who will thus have an opportunity of meeting and mingling with men who count in the sugar industry abroad.

Many important papers have already been received, and they cover various aspects of the genetics, pathology, entomology, and cultivation of sugar-cane, as well as sugar manufacture. In addition, reports will be submitted by special committees on identification and description of the original cane varieties; uniformity in reporting factory data; soil studies; and the technique of field experiments.

The coming congress will mark an important stage in the progress of the sugar industry in Australia. Its success is already assured. Not the least of its advantages will be the impressions of a thriving and well organised industry that the visiting delegates must carry away with them. The field and factory efficiency of the industry in the only country in the world that produces cane sugar by white labour in accordance with white labour standards, surely cannot fail to impress any impartial and comprehending observer.

The National Value of Sugar.

An official table showing the increase in population in far northern sugar districts during the last twelve years is of particular importance at this time. Covering the northern or tropical portion of the State, the table is based on the returns of the 1933 census. During the period since the previous census was taken, the population increased to 96,808, or 87.5 per cent. of the coastal population, equal to an added 45,186 in the twelve years. Here are the comparative census returns:—

	1921.	1933.
Cairns (City)	7,455	12,004
Mackay (City)	6,320	10,660
Ayr	6,262	12,085
Cairns (Shire)	5,737	10,378
Tully	370	4,412
Mossman	1,350	2,902
Ingham	5,503	10,199
Innisfail	5,549	12,774
Mirani Shire	3,439	4,405
Pioneer Shire	5,701	9,927
Plane Creek	1,635	3,121
Proserpine	2,291	3,941

The increase in population for the whole of Australia during the same period was 29·94 per cent.; that of Queensland was 25·06 per cent. This shows how the tropical north has far out-paced every other agricultural portion of the Commonwealth. There are now six sugar centres from Mackay north with populations exceeding 10,000 people, and even to cane farmers it will come as a surprise that Ayr, Ingham, and Innisfail (Johnstone River district) carry populations of that number. The Ayr district now exceeds Mackay city area in population, as does Ingham and Innisfail. Of course, if the population of Mackay's tributary territory were added to that of the Mackay urban area the population of the whole district would be much greater than any of the other cane-growing districts, with the exception of Cairns; but that fact does not detract from the remarkable development that has taken place in the Burdekin, Herbert, and Johnstone River valleys. As pointed out in the pamphlet issued recently by the Minister for Trade and Customs justifying the Sugar Agreement, the national aspect of the sugar industry is further illustrated by the fact that most of the fertile coastal lands of the North would be depopulated if there were no sugar industry, and further that a good deal of the development in the North Queensland back country would not have occurred if it had not been for the settlement of the sugar lands along the far northern coast. It is also stated that residents of Northern sugar areas constitute the largest white population in the world living in the tropics, whose health, virility, and physique are not excelled by any other group of Australians. So far as Queensland is concerned, sugar production utilises no less than 20 per cent. of the cultivated land, the value of the sugar-cane is nearly 60 per cent. of the value of all Queensland agricultural production, and is 20 per cent. of Queensland commodities of all kinds. Its annual wages bill is valued at £5,000,000. That it is a white man's industry is proved by the fact that 79·8 per cent. of the persons engaged on farms and mills are British born—that is to say four-fifths of them are not only white, but British-born. Of the remainder, 10·1 per cent. are naturalised Britishers, and only 10·1 per cent. are foreigners, and they, no doubt, are Australian citizens in the making.

Insect Enemies of Lantana.

By ROBERT VEITCH, B.Sc. Agr., B.Sc. For., F.R.E.S., Chief Entomologist.

THE Department of Agriculture and Stock has recently received a considerable number of inquiries on the subject of insect enemies of lantana, keen interest evidently now being manifested in the possibility of the satisfactory biological control of that introduced plant. The time, therefore, seems opportune for a brief review of what has been attempted and what has been achieved in the control of lantana by the introduction of some of its more important insect enemies. Several of these have already been established in certain of the countries to which lantana has spread, and in which it either threatens to become or has already become a serious weed pest. Before discussing the insects themselves mention must, however, be made of the present status of lantana in Queensland.

Status of Lantana in Queensland.

The species of lantana at present under consideration is *Lantana camara,* a plant that is now very widely distributed throughout coastal and near-coastal Queensland, infestation extending from the New South Wales border to the most northerly settled portions of the State. This plant is a native of the tropical and subtropical regions of America, but it has been introduced to many other tropical countries where its presence is now generally regarded as a menace. It was introduced because of its attractiveness as an ornamental shrub and, so far as is known, its original sponsors never claimed that it possessed any distinct merit as a green manure or a soil renovator. In Queensland it is definitely regarded as a weed pest in dairying and grazing districts, where it has also been associated on frequent occasions with losses of stock. Furthermore, it has spread rapidly in certain reafforested areas in the State, and the cost of keeping the weed in check on such land is extremely high. The weed is of no consequence in agricultural areas as it is readily held in check wherever cultivation is regularly practised, while in some avenues of primary production it is regarded favourably as a soil renovator, banana growers frequently utilising it for such a purpose. Viewed as a whole, however, lantana is an undesirable introduction, hence the recently manifested interest in its control by the use of introduced insect enemies.

Hawaiian Introductions.

The first move in the campaign for the biological control of lantana was made as long ago as 1902 when a number of insect enemies of the weed were introduced from Mexico to the Hawaiian Islands. Lantana had by then spread alarmingly in the grazing areas of that country and, with the enterprise characteristic of its settlers, Hawaii decided to institute the first attempt at biological control of a weed pest. An entomologist was accordingly dispatched overseas in search of the necessary insects. A large number of these were soon found associated with lantana in Mexico, and during 1902 attempts were made to introduce no fewer than twenty-three of these beneficial species. Success was achieved in the case of eight species, the feeding habits of which are briefly as follows:—The larvæ of two small species of pretty blue butterflies feed on the clusters of flowers. The larvæ of a small species of

moth tunnel in the young twigs and also attack the clusters of flowers and the developing berries. The larvæ of another moth attack the flowers, while the larvæ of a third species of moth mine in the tissue of the leaf between the upper and lower surfaces. The nymphs and adults of a small bug, commonly known as the lantana leaf bug, characteristically suck the sap of the foliage, thereby causing appreciable and repeated leaf fall leading to a reduction in flowering. The remaining two enemies successfully introduced in 1902 are the stem gall fly, the larvæ of which feed within the young twigs, and the well-known lantana seed fly, the maggots of which feed within the lantana berries.

The reader will note that the main function of all the species, with the exception of the lastmentioned, is to directly or indirectly reduce the production of berries, while the function of the lastnamed insect is to reduce the germination of the seeds of such berries as are formed and to render the berries less attractive to fruit-eating birds likely to disseminate the seed.

Introductions Elsewhere.

Several of these enemies of lantana have been subsequently introduced to other countries, Fiji, India, and Australia having been assisted in this manner. The lantana seed fly is established in this State and steps are now being taken to introduce the lantana leaf bug to Australia, hence these two species are of most immediate interest to Queenslanders, and the rest of the discussion in this brief article will be devoted to them.

Lantana Seed Fly.

The lantana seed fly, *Agromyza lantanæ* Froggatt, was established in Queensland as far back as 1917, and colonies of this insect were subsequently sent to various lantana-infested districts throughout the State. The present position is that this small fly has been found wherever the entomologists of this Department have searched for it, and it is considered highly improbable that there is any lantana-infested area in which it does not now occur. Frequent requests are received for colonies of the seed fly, but it is believed that little useful purpose is now served by further distributions.

The lantana seed fly is a very small black insect which lays its eggs in the lantana berries, egg-laying being generally restricted to a single egg in each berry. After the usual incubation period a small maggot emerges from the egg and commences feeding in the outer pulp of the berry, the seed also being usually subsequently attacked. Infestation can be detected by the presence of brownish areas on the otherwise green berry, which on being cut open will be found to contain the seed fly maggot with its tunnels showing clearly in the pulp or seed. The slender, whitish maggot is about one-tenth of an inch in length when full grown. It then pupates in a yellow pupal case inside the berry in which it fed. The tissues of the maggot undergo a complete reorganisation in the pupal stage as a result of which the small, unimpressive-looking fly is produced. A considerable number of generations occur in Queensland in the course of a year, the time required for a single generation being much shorter during summer than is the case in the colder months of winter.

The presence of this fly in Queensland can obviously exercise no adverse influence whatever on the health of already established lantana plants, as its activities are confined entirely to the berries. The feeding of the maggots within the berries does, however, lead to a reduction in

the percentage of germination of the seeds. Furthermore, infested berries are not so attractive to fruit-eating, seed-distributing birds as those that develop normally without infestation. The general effect of the presence of this beneficial insect is to slow down the rate of spread of the lantana, but without the assistance of other insects it cannot prevent the spread of the weed. Unfortunately, there are no introduced insect enemies restricting the production of berries in Queensland, and in view of the fairly prolific nature of lantana seed production it is considered that the establishment of the lantana seed fly has by no means solved the problem of the biological control of that serious weed pest. It is believed, however, that the small expense involved in its introduction by the State Department of Agriculture and Stock has been justified, particularly in view of the fact that it may now receive assistance from other introduced insect enemies likely to reduce the production of lantana berries.

Lantana Leaf Bug.

The lantana leaf bug, *Teleonemia lantanæ* Distant, is rather a pretty, greyish-brown insect, measuring an eighth of an inch in length, its shape being somewhat elongate oval. Like most of its relatives, this insect feeds both in the adult stage and in its immature or nymphal stages by piercing the surface of the foliage of its host plant and extracting the plant sap through the punctures thus formed. When conditions are favourable to its propagation extensive and repeated defoliation may occur, flowering and berry production being thereby checked. The flowers may also be attacked, but foliage feeding is typical of this bug.

This species is under consideration for introduction to Australia, the work being in the hands of the Division of Economic Entomology of the Council for Scientific and Industrial Research. The Council has in recent years devoted much attention to the problem of weed pest control, and the search for beneficial insects to be used in the campaign against weed pests is now a function of Federal institutions, hence the proposed introduction will be handled by the Council.

Readers are reminded that some little time must necessarily elapse before this insect can be colonised in Australia. It must be tested against common economic plants before being liberated in order to ensure, so far as it is possible to do so, that it will not be a menace to any branch of primary production. Even when it has passed such tests some time must also elapse before large colonies can be bred up for liberation.

The Pinhole Borer of North Queensland Cabinet Woods.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

(*Continued from page 14, volume XLIV.*)

RELATION OF THE BORER TO RAIN FOREST AREAS.

THE actual insect population on the wing must always be determined by seasonal factors in the first instance, but even during the summer months subsidiary influences come into play which may affect the degree of infestation. The insect population, irrespective of seasonal conditions, is limited by the available breeding material for the species, hence in areas subject to logging, the pin-hole borer population which infests tree residues will be numerous. Many of the areas from which timber supplies are at present being drawn in North Queensland have been logged for some years and insect attacks are now severe.

During 1933 trees were felled in January, February, and March for observational purposes, sapwood being exposed to facilitate attacks by *C. grevilleæ*. During those months the borer population as measured by log infestation was uniformly high yet the attacks on these three trees differed significantly. The first tree cut in January suffered heavy infestation; the second, 2 chains away from the first, escaped with light attacks; while the third tree, cut in March and only 4 or 5 chains away was riddled with borers. It is possible that the second tree fell within the limits of the chemotropic attraction exerted by the first tree while the third fell outside it. The second tree would then be felled in an area from which most adult *C. grevilleæ* had been drawn by the first tree, leaving the free-living Crossotarsan population at a relatively low level. This, together with the increase of free-living adults through fresh emergences might explain the phenomenon. If this is so, one must conclude that the limit of chemotropic attraction is not more than two or three chains.

The limits of such attraction have been checked by dumping logs at intervals outside the rain forest area during the present summer, when conditions were favourable to infestation. Logs have been cut and hauled to dumps 1 chain, 5 chains, and 80 chains from the rain forest boundary. Immediate infestation was delayed for a few weeks owing to the excessively wet weather, but fresh susceptible surfaces were exposed periodically to maintain the attraction of the log material for the insect. When temperatures resumed their fine-weather level, infestation within the rain forest was high and that on the nearest dump moderate. The infestation at the 5-chain limit was, however, negligible, while logs at the farthest dump remained free from attack.

The importance of chemotropic influences can be deduced from numerous observations, the concentration of infestation at bark edges where sap exudations are greatest, the heavy infestation of bark once the superficial layers are removed, and so on. As logs lying in rain forest clearings are attacked, open spaces in themselves are not inimical to the movements of the insect. Susceptible material thus appears to draw insects from the rain forest environment. The chemotropic pull, for *C. grevilleæ* at least, also seems to be much less than is commonly supposed. The distance over which chemotropic attraction is effective

will, however, doubtless vary with the freshness of the tree or log, being greatest when the sap is running freely. In view of this, the experimental limit beyond which logs were not attacked may in practice be exceeded, as the log material had been cut for some weeks before infestation was possible. Still the essential point remains that similar material in the rain forest suffered heavy infestation, and suggests that judiciously placed ramps may be of some use in minimising borer losses.

Natural Breeding Centres in the Rain Forest.

The pin-hole borer, *C. grevilleæ*, is essentially a rain forest species, and natural breeding material must be available for its continued propagation. Where large-scale logging is in progress, tree residues are strewn throughout the area. These residues consist, as a rule, of the upper part of the tree trunk, together with the head, the amount of trunk depending on the girth of the tree and the minimum size of the logs which can profitably be cut from it. Sometimes 20 feet or more of the trunk may remain, but usually the bark is undamaged, for the head of the tree clears a track for the bole during its fall. The examination of these log residues brings some interesting facts to light.

As the trunks of mature trees are heavily barked, infestation of the bole is infrequent for, under natural conditions, deterioration of the bark may not involve any great amount of splitting. Infestation of the bole in tree residues by *C. grevilleæ* is, therefore, less important than that of various shot-hole species which freely penetrate intact bark.

As *C. grevilleæ* readily enters logs or tree residues only through exposed wood, access is largely restricted to fractures or fresh sapwood from which the bark has been torn. Most trees, when they strike the ground, take the initial strain of impact through one of the larger limbs, which may be partly severed from the main trunk. The fracture normally appears at or just above the fork, and often cuts right into the limb and sometimes into the centre of the bole itself. The greater part of residue infestation takes place in the vicinity of these fractures. As the insect normally works across the grain, only a limited area may be affected, though, if the infesting population is high, there may be some development of the burrow system along the length of either the bole or the limb. The area affected is seldom considerable, and may not exceed 6 feet in length.

All residues may not show the usual infestation, those from trees felled during the winter months being uninfested, while those cut during the remainder of the year may suffer severely.

Under natural conditions, breeding would be restricted to trees which are brought down during cyclonic blows or other mishaps with similar effects, provided the timber were still sound. In compartments which are logged irregularly from year to year, a cumulative increase of the borer population above that usual in the natural rain forest seems inevitable, for log residues contain wood better suited to the requirements of *C. grevilleæ* than naturally dying trees which must form a large proportion of those collapsing in unlogged areas.

RELATIONSHIP TO OTHER BORERS.

Though *Crossotarsus grevilleæ* has been treated in this paper as an entity suitable for independent discussion, very few logs suffer attacks from this species alone. Actually, though its importance for

the veneer manufacturer is greater than that of any other insect, the symptoms of attack by shot-hole species are more obvious in most uncut logs. Shot-hole borers are for the most part much larger insects, and the accumulation of debris at the burrow mouths immediately attracts attention. They are, however, essentially softwood feeding insects, though they may occasionally venture into faulty and decaying heartwood. In this respect they are quite unlike *C. grevilleæ,* which freely penetrates the heartwood of all important cabinet wood logs in North Queensland; hence, while shot-hole species may be of appreciable importance in plywood manufacture, where the whole of the log has a high sales value and sapwood represents a fair proportion of the log volume, they can never ruin a log so effectively as *C. grevilleæ.*

The more important shot-hole species in the North are *Platypus australis* Chap., *P. omnivorous* Lea, and *P. semigranosus* Samp. Other species occasionally frequent logs in association with these, but not as dominant forms. All, unlike *C. grevilleæ,* freely penetrate the bark, though usually an interval has to elapse after felling before attack is possible on a large scale. They may also penetrate exposed sapwood. There is little if any apparent association between the activities of any two species, though sometimes *C. grevilleæ* gains access to sapwood through bark burrows of *P. australis.* Here *C. grevilleæ* enters the log through the external opening of the shot-hole borer and, branching out from the entrance tunnel, initiates a burrow system of its own. The relationship is a simple one, the shot-hole species merely giving *C. grevilleæ* indirect access to the sapwood.

Of the pin-hole borers, *Xyleborus hirsutus* Lea, *X. compressus* Lea, *Xyleborus* sp., and *Platypus* sp. may be found in logs subject to *C. grevilleæ* infestation. *X. hirsutus* and *X. compressus* are essentially sapwood feeding species which normally penetrate the log directly through the bark. *Xyleborus* sp., a very small insect, may, however, heavily infest exposed sapwood, especially under shade conditions, and as the burrow dimensions are similar to those of *C. grevilleæ,* confusion between the two is easily possible. Like other species in the genus Xyleborus, it is a sapwood feeding type.

Platypus sp., a small pin-hole borer similar in size but morphologically quite distinct from *C. grevilleæ,* possesses habits somewhat analogous to it. In the rose butternut, *B. involucigera,* the most important known host, the burrow system penetrates the whole of the log. The dimensions of the burrows are alike, pupal chambers have the same disposition in the heartwood and, without live material, distinctions between the two burrow systems would be difficult. Normally this insect is a rarity on logs cut for commercial purposes, and it apparently prefers dying trees as hosts. At all events, though minor infestation has been frequently observed in logged timber, heavy attacks have been noted in one instance only. A rose butternut collapsed during a cyclonic blow in 1934, and though alive prior to its fall, the stump showed signs of advanced decay. This tree was infested through the whole length of the bole, both heartwood and sapwood being riddled by its complicated burrow system. Dying trees are apparently particularly subject to attack, and infestation normally takes place through the bark.

It is thus clear that *C. grevilleæ* is unique among the Platypodids in North Queensland rain forests, as some of its habits have no known

parallel in the life histories of other species. These differences have considerable bearing on the control of the insect and are discussed in some detail later.

SUGGESTED MODIFICATIONS IN LOGGING PRACTICES.

Under ordinary circumstances, logging is concentrated in the drier months of the year as haulage conditions during the wet summer months tend to hamper the movement of timber. In spite of this, the commercial demand for logs may compel cutting and hauling through the whole of the year, even though the roads are almost impassable. Hence a part of the annual output of timber is cut during the borer active months, though its proportion to the whole varies from year to year. Summer logging always carries an element of risk for, though logs may be cut, further rains may prevent their removal, and the timber remains in the rain forest environment for some considerable time. When hauled directly after cutting to the station ramp for railing and milling at early date, the time interval in which the borers can work is limited and the ultimate loss may not be great. With high infestation and a long delay before milling, the whole of the sapwood may be destroyed if shot-hole infestation is dominant, while the whole of the log may be ruined for veneer work if *C. grevilleæ* has gained access to the sides. As milling dates can seldom be definitely known when the logs are cut, various methods have been adopted to cope with the difficulty. Sometimes the bark is left intact, save for the strip removed to facilitate girth measurement, or sapwood may be either completely or partly dressed from the log. Sapwood removal is frequently adopted to minimise freight charges in long-distance transport.

Some obvious precautions should lie behind any large-scale logging programme. If practicable, logging should be confined to the winter months, when haulage conditions are reasonably good and logs can be removed from the rain forest quickly. Inferior logs cut from over-mature or faulty trees should be milled locally, so that the best use can be made of second grade timber without incurring freight charges on inferior wood. In all cases the logging history of the timber should be known. Without this there is no certain method of estimating the probable borer loss, as the ultimate wastage can only be approximately inferred from external features. These external features merely indicate the extent of the infestation, but when the period of the attack is correlated with the known habits of the insect, log values can be better estimated.

Merits and Demerits of Bark Removal.

As already pointed out, the intact bark of commercial logs prevents infestation by *C. grevilleæ*, even when the population on the wing is at its height. Once the bark begins to break away from the sapwood, infestation may take place. The loosening of the bark occurs naturally in many species some months after felling, and may be hastened by rough handling during haulage in which strips of bark are torn from the surface of the log. Trees felled in midwinter have been found shedding bark during the summer months to expose sapwood which was immediately attacked by *C. grevilleæ;* hence there can be no certainty that a winter felled log will prove immune to borer injury if left in or near the rain forest with the bark intact. Ordinarily negligible infestation would take place at the ends and the outer parts of fissures when the log was cut. Some months later supplementary infestation occurs

when the bark breaks down; hence intact bark may facilitate delayed infestation. Had the bark been removed when the logs were cut, subsequent immunity from attacks by *C. grevilleæ* would have been ensured by the superficial drying of the sapwood.

A log cut during the summer and handled in the same way would shed its bark during the winter months when few insects are on the wing, and would consequently suffer little injury. It follows that barking projects for logs compulsorily held in or near the rain forest should only be sanctioned during the winter months, when the bark may be stripped from logs if necessary. In summer, the bark must be left intact until the activity of the insect is on the wane, when barking can be carried out with reasonable safety.

In any case, special treatment within the rain forest should not normally be necessary, as sound harvesting practice requires the immediate transport of logs to ramps outside the forest area.

Location of Ramps.

The utility of bark removal presumes the dumping of logs in or near the rain forest. Sometimes this is unavoidable, but where practicable logs should be hauled outside the forest area as soon as they are cut. The borers which attack North Queensland cabinet woods are most common in the rain forest, and invade open country only under special conditions. In the North, where rain forest has been destroyed to permit agricultural development, logging is chiefly carried out in the little exploited country bordering farming areas, but even within the settled areas clumps of standing rain forest occur. These small areas are really subsidiary breeding grounds for the borer species, and have the same significance for the forester as larger areas where logging is in progress. Normally open country on which agricultural pursuits are practised is pasture or cropped land from which the original flora has been entirely removed. Logs can be dumped in it with comparative safety, as there is no floating insect population capable of attacking timber recently removed from the rain forest. Experimental work has shown that logs may be conveniently dumped in such open country without risk of entomological complications, the safe limit from the rain forest being in the vicinity of half a mile.

On the coast, most of the rain forests being logged are bordered by hardwood Eucalypt country, the ramps being mainly situated in the latter. The susceptibility of log material to infestation by the more important rain forest species, including *C. grevilleæ*, is negligible in hardwood forest, with the exception of *Xyleborus hirsutus*, which is commonly found in Eucalypts. This species may thus become a menace to cabinet woods stored on hardwood forest ramps. Of the three main types of ramps, those in open country are the most desirable, those in the rain forest definitely dangerous unless protected by a canopy, while those in hardwood forests vary with the floating population of *X. hirsutus* to which the logs are subjected. Where practicable, logging programmes should use the first of these.

Utility of Open Country Ramps.

Ramps serve a double purpose. They are convenient breaking points for the different phases of transport, facilitating the change-over from bullock teams to motor or rail, and they give easy access to the timber for grading and inspectional purposes.

With even reasonable precautions, a certain amount of insect infestation may take place before logs reach an open country ramp and, while sound logs may be forwarded immediately, others require further handling at this stage. If the insect infestation is recent, the insects and the defective timber may be cut out with an adze, the advisability of the operation depending entirely on the quality of the log and the uses to which it may subsequently be put. Should sapwood species only be in possession, and the proportion of sapwood to the whole of the log small, treatment of any kind may be unnecessary. Were the timber a softwood suitable for ply purposes and subject to heavy shot-hole borer infestation, it might be profitable to cut away the affected outer wood to ensure that the rest of the log will be sound when milled. If *C. grevilleæ* has taken possession of the log, both sap and heartwoods may ultimately be destroyed. Adze dressing may then be desirable, for the infested wood can be removed and the risk of further loss obviated, a loss which would be inevitable were no steps taken to remove and destroy the insects. Frequently this type of inspection is practised in the mill yards before sawing, after purchase and delivery of the logs. Unfortunately, while such an examination may obviate faulty handling at the mill, it cannot affect any loss sustained through the purchase of logs for cabinet wood purposes which ultimately cut into second class constructional timber. The thorough inspection which can safely be made on open country ramps should eliminate losses of this type.

Measuring as at present practised frequently takes place in the rain forest, a strip of bark some 6 inches in width being removed from the circumference of the log to allow the free use of a tape. Apparently a sapwood girth measurement is a necessary factor in the present methods used for volume computations. Insect infestation through these barked strips is common, and *C. grevilleæ* may gain access to logs which would otherwise be immune from its attacks. Once established, this insect works through the log in a radial direction, and the timber when cut for veneer shows flaws which have to be removed. Wastage of this type is directly attributable to the measuring of logs in the rain forest. To obviate such losses, it is suggested that when practicable, measurements should be taken at ramps situated in open country where the risk of insect attack is negligible. If measurements must be made in the rain forest, an alternative system of volume computation may be devised in which bark measurements can be substituted for sapwood measurements. In any case, working conditions in the rain forest militate against the accurate measurement of logs and, quite apart from entomological considerations, suggest a more general policy of ramp measurements and inspection.

Canopy Ramps in the Rain Forest.

Sometimes the dumping of logs within the rain forest is due to lack of co-ordination between cutting and haulage, especially if wet weather hinders the rapid transport of logs. These logs may be located near the tree from which they have been cut or at intermediate ramps in the rain forest. In either case, borer species will be numerous and the timber liable to heavy infestation, hence every effort should be made to avoid delay in the haulage of logs to the outside of the worked area.

In some State forests, ramps of one type or another are unavoidable if efficiency is to be maintained, for the distance from open country is more than a reasonable haulage stage. The data for *C. grevilleæ*

permits a suggestion which may have some practical utility when the inner recesses of the rain forest are being exploited. Mass infestation by this species occurs at rain forest temperatures in the vicinity of 82° F., and infestation at lower temperatures is on a much attenuated scale. Similar influences, though not so well defined, apparently affect some of the more important shot-hole species, for canopied logs suffer much less than those in rain forest clearings. Rain forest ramps at present in use are invariably in cleared areas, and heavy infestation usually occurs during the summer months.

Temperatures under canopy are much too low for mass infestation of logs by *C. grevilleæ* and attacks by this species, if any, are on a much attenuated scale; hence if heart wood protection is required, logs suitable for veneer purposes may be safely stored in canopied ramps. They may still suffer infestation by sap wood feeding species. In experimental material comprising five log types with some sap wood exposed to infestation, the insect attack has been due to insects which are rarely found on logs handled in the ordinary way. Thus an insect fauna in which *Platypus* sp. and *Xyleborus* sp. are dominant is substituted for the normal *C. grevilleæ* — *P. australis* — *P. omnivorous* association. The former lacks any heart wood infesting species and the two sap wood feeding forms are less destructive than either *P. australis* or *P. omnivorous;* hence canopied ramps may be of some service in eliminating heart wood injury and lessening the incidence of sap wood destruction.

In practice, some level area near one of the feeder roads would be chosen for a canopied ramp, the undergrowth which makes no great contribution to canopy being cleared so that teams can freely operate. Heavy canopy is, of course, to be preferred, but under ordinary rain forest conditions, both mature and semi-mature trees would form the essential elements. The actual form of the canopied area is largely dictated by the common usage of bullock teams for haulage purposes and an illustrated example is shown. Variations could be introduced to meet the needs of any particular situation.

The suggested ramp (Plate VI., Fig. 4) consists of a branch to the main feeder road with turning facilities for bullock teams at its furthest point. Alcoves sufficiently large to accommodate the ordinary sized logs are cleared at the sides by the removal of undergrowth and may be sufficiently deep to house some eight or nine logs. Both the branch road and its associated alcoves are then under complete canopy. Logs when cut would be hauled to a convenient canopy ramp and thrown off at the entrance of one of the alcoves, to be later drawn into position by means of haulage tackle hitched to a suitable tree. Each alcove would be either filled with freshly cut logs or its contents shifted to open country ramps at the one operation to avoid the accumulation of logs of different ages in the one alcove.

The regularity shown in the illustration would hardly materialise in practice, for the direction of branch paths and the precise location of alcoves would depend on the distribution of the more important canopy elements; but provided bullock teams can work comfortably, regularity is quite a secondary consideration. Normally canopy ramps would improve in efficiency from year to year as the overhead closure becomes more effective.

The Utility of Trap Trees.

Trap trees are sometimes used to lower the free-living insect population which would otherwise attack logs used for commercial purposes. The method originated in countries where harvested trees grow in pure stands either naturally or following sylvicultural practices adopted when plantations were established. In North Queensland the areas being exploited consist mainly of mixed rain forests in which many species of trees at all stages of development make up the flora. Logging is therefore scattered over large areas and trap trees can only be of limited utility.

The trap tree method may, however, be useful when virgin areas are about to be intensively logged for a short period as, for example, in exploiting areas shortly to be used for reafforestation purposes. Once a reafforestation project has been approved, logging operations are centred on the area prior to the felling and burning of small non-commercial timbers. Such an intensive logging programme may begin in the summer months to allow its completion before clearing commences and borer losses may then be minimised by the cutting of trap trees some six weeks before harvesting work is initiated.

Trap trees comprise the more susceptible species of less than commercial girth and white silkwood or quandong may be cited as types. The bark may be partly removed at the time of felling, trees being cut at intervals of some 5 chains throughout the area. These will attract the free-living adults of both shot-hole and pin-hole species and thus lower the insect population on the wing when logging begins.

The method has decided limitations in North Queensland where the mixed flora and the uneven demand for available mature timbers causes irregular exploitation of the logging areas.

SUMMARY AND CONCLUSIONS.

I. *Crossotarsus grevilleæ* Lea is the most important Platypodid borer to the manufacturer of veneer from North Queensland rain forest cabinet woods, as it may penetrate the whole of the log if milling is delayed. The host plant range is a wide one.

II. The sexes are separable on morphological characters. The female is larger than the male and prior to entering the log possesses a large forwardly projecting appendage to each mandible. These appendages are shed when burrowing begins.

III. The male initiates the burrow but subsequently the female extends it through both the sap and heart woods with the collaboration of larval progeny. Eggs may be laid discontinuously by the parent female for a period of some twelve months, and larval development requires a similar period before pupation takes place in typical Platypodid grouped chambers. The adult progeny finally excavate exit tunnels to either the surface of the log or fissures which lead to the outside. Burrows at the sides of commercial logs are initiated only through exposed sap wood and the openings are concentrated on the latero-dorsal surface in barked logs. Some infestation may also take place at the sawn ends.

IV. The initial attraction to the log seems to be chemotropic and crushed wood suffers the heaviest attack. The chemotropic stimulus is also present in the bark but is usually effective only when the superficial layers are removed or injured.

V. The burrow system may exploit the whole cross section of the log, but burrow paths lie approximately in the one plane, cutting across the grain of the woods. If the insect population is high, *C. grevilleæ* may excavate burrows on the surface of the sap wood and re-enter the wood further along the log.

VI. In the rain forest, the insect population is kept high by the free reproduction of *C. grevilleæ* in tree residues. Wood surfaces suitable for infestation are exposed at fork fractures induced by the fall of the tree.

VII. Bark resistance in commercial logs to *C. grevilleæ* infestation is due to the physical properties of the superficial layers. The main body of the bark, at least in the walnut bean, is attractive to the insect and heavy infestation, though limited burrow extension, is possible within it. The behaviour of the insects in induced bark infestation is in some ways quite different from that in sound wood.

VIII. Mass infestation of log surfaces takes place when temperatures are in the vicinity of 82°F. At lower temperatures the attack is on a much attenuated scale. The seasonal activity of the pest and its importance in climatically distinct logging areas conforms with the known temperature requirements of the species.

IX. Logs held under complete canopy where temperatures seldom rise above 80°F. are rarely attacked. Similarly, logs more than 5 chains outside the rain forest escape infestation. In the latter case, the chemotropic stimulus peculiar to the felled log or sap wood surfaces of barked logs is insufficient to draw the insect from the rain forest area.

X. Logging practices to minimise losses from *C. grevilleæ* are discussed. Co-ordination of cutting and haulage to ensure rapid transport to open country ramps, the conversion of some existing ramps to open country ramps, and the systematic measurement of logs outside the rain forest are considered desirable. Rain forest ramps, if indispensible, should be of the canopied type.

Acknowledgments.

These investigations have required constant collaboration with officers of the Sub-Department of Forestry. The writer is particularly indebted to them for information on harvesting practices and for undertaking haulage and other operations incidental to the experimental work. The systematics of *C. grevilleæ* have been simplified by the late Mr. A. M. Lea, and some of the biological problems investigated were designed to clear up confused points of mutual interest. The excellent illustrations by Mr. I. W. Helmsing are a very valuable supplement to the paper. Critical discussions on the subject matter with the Chief Entomologist, Mr. Robert Veitch, have been most stimulating and to him the writer is indebted for the many official facilities placed at his disposal.

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Tuberculosis.

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TUBERCULOSIS is a contagious disease affecting animals, poultry, and man. Of the domesticated animals those most commonly affected are cattle and pigs, but it has also been noted in horses, dogs, and cats. Sheep and goats are very rarely affected.

The cause of the disease is a germ known as the *Tubercle bacillus*. This germ, when exposed to the direct action of sunlight, is killed in two hours, but under natural conditions it is enclosed in discharges or manure which act as a protection against the sun's rays enabling it to persist for months on pastures, &c. It is not killed by freezing, but the treating of contaminated milk to 180 deg. Farenheit for ten minutes will kill the germ.

Three types of *Tubercle bacillus* are recognised, but some types are capable of infecting other animals as well as their usual host, as shown in the following table:—

Bovine type may cause tuberculosis of—

Cattle	Horses	Rare
Pigs	Cats	
Humans	Sheep	
	Goats	

Human type may cause tuberculosis of—

Humans	Poultry	Rare
Pigs	Dogs	
	Cats	

Avian type may cause tuberculosis of—

Fowls
Pigs

This is very important, as we shall note later, particularly with regard to control of the disease in animals and its importance from a public health standpoint.

Methods of Infection.

The germ gains entrance to the body of the animal in the following ways:—

(1) Inhalation.—The *Tubercle bacillus* withstands drying quite well, so that the inhalation of dust, dry particles of dung, dry milk, sputum discharges, &c., which are contaminated with the germ is a common method of infection. This is particularly so in the case of cattle and human beings. Inhaling the breath of animals whose lungs are affected is another possible way of contracting the disease.

(2) By the mouth.—This is the commonest method of infection in pigs, fowls, and probably cattle. The contaminating material is the same as that described under the previous heading, with the addition of milk and diseased meat. The presence of tuberculosis in pigs found after slaughter is a very useful indication of its presence in the dairy herd. The infection of pigs may be caused by feeding them tubercular milk or by allowing them access to diseased carcasses

or manure from diseased cows. When tuberculosis is found in pigs its origin should be sought among the dairy cattle. It should be borne in mind, however, that pigs may also contract the avian (fowl) type, and if fowls and pigs intermingle there is a possibility that the infection may be coming from that source.

(3) Other methods of infection are *via* wounds, from mother to the unborn young, from bull to cow during service. These methods are fortunately unimportant, and we may regard the two main ways by which the animal contracts the disease as inhalation and by the mouth.

Symptoms.

Cattle.—The symptoms of tuberculosis in cattle may easily be confused with those of other diseases, but although it is not always possible to make a definite diagnosis on the symptoms suspicious cows may frequently be detected.

It is important to realise that many cattle affected with tuberculosis show no symptoms whatever, while in others the disease is fairly obvious.

Tuberculosis is a chronic disease and not always fatal in domestic animals.

Slow progressive emaciation, harsh staring coat, and poor milk yield are often indicative of tuberculosis.

There is often a soft, moist, persistent cough most noticeable when the beast is disturbed. Snoring or grunting in the throat are often a sign that the glands in the throat are affected. Snoring should not be confused with a "snuffling" noise originating in the nose, and caused by a thickening and inflammation of the nasal mucous membrane (nasal granuloma).

The commonest sites of lesions in cattle are the lymphatic glands. These are roundish bodies, most of them situated internally, but some of them in the tissues underlying the skin. Reference to the accompanying diagram shows the position of these more common superficial glands.

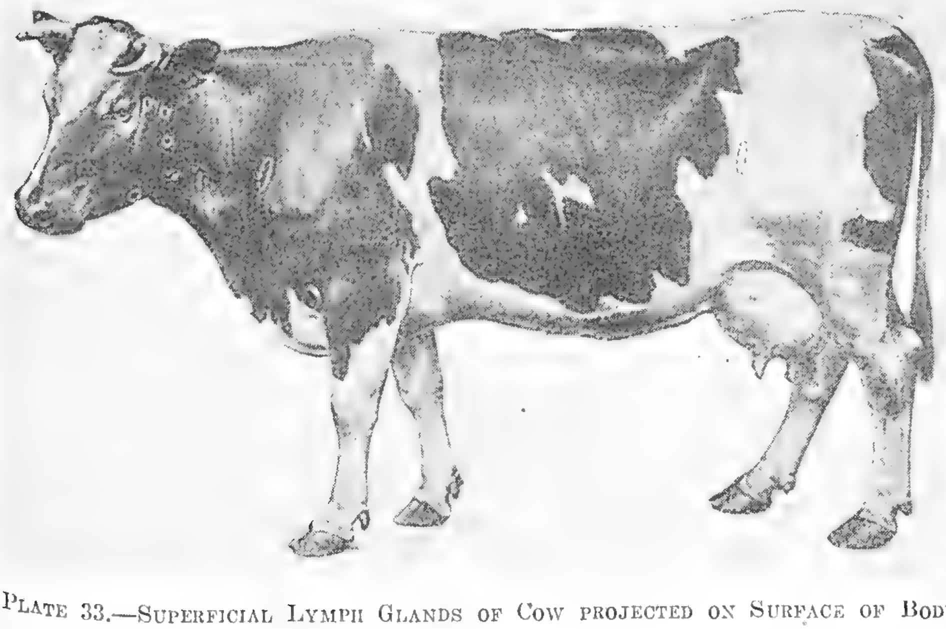

PLATE 33.—SUPERFICIAL LYMPH GLANDS OF COW PROJECTED ON SURFACE OF BODY.

The superficial lymphatic glands may be felt with the fingers, particularly when they are diseased. Tuberculosis of these glands causes a gradual, non-painful swelling.

The udder is sometimes affected with tuberculosis, where it causes a progressive hardening of one or more quarters without pain or heat and without much change in the milk. These cows are particularly dangerous, as the milk always contains the Tubercle bacillus, and if fed to pigs or child exposes them to a very grave risk of infection.

Later the udder becomes enlarged and extremely hard, while the milk yield is considerably diminished. Other symptoms of tuberculosis are persistent diarrhoea, frequent bulling, enlarged testicles. These are not very diagnostic, however, as they may be caused by such a variety of other diseases.

Pigs.—Emaciation may be noted, but in most cases the disease is not seen until inspection after death or slaughter.

Fowls.—Loss of weight, gradual emaciation, weakness, lowered egg production, pale comb, and ruffled feathers are the first symptoms. The fowl maintains a good appetite throughout. Later the birds become very drowsy and keep apart from the remainder of the flock. Sometimes the skin and joints are affected. Birds do not die rapidly but linger on for weeks or months.

Post Mortem Appearances.

Cattle.—The disease is characterised by the formation of abscesses in the lungs, lymphatic glands, or mammary glands which contain yellowish cheesy pus. In old-standing cases there is often a gritty substance in these cheese-like masses due to a deposit of lime salts.

If the lining of the chest or abdomen is affected numerous grape-like or pearl-like nodules are observed clustered on the inner wall of the chest or abdomen. If these be cut open they will be found to contain small pockets of cheesy pus similar to that already described. Another form of infection is known as military tuberculosis when the germs are carried throughout the body by the blood stream. Death is usually fairly rapid in such cases, and if the animal be opened countless millet seed-like abscesses will be seen throughout the organs, particularly the lungs, liver, and kidneys.

Occasionally abscesses are also present in the liver, kidneys, muscle, testicles, and heart. Tubercular pus has no disagreeable smell, and in this way can be differentiated from pus caused by other germs.

Pigs.—The commonest site of abscesses in the pig is the lymphatic glands of the head, throat, and intestines. Sometimes the lungs and more rarely bones and other structures are also affected. The pus is whiter and usually the abscesses are smaller than those of cattle.

Fowl.—Most of the lesions are situated in the abdominal organs, viz., the mesentery (membrane from which intestines are suspended), ovary, liver, lining of the abdominal cavity, and intestines. The lesions are pearly greyish-white nodules varying from the size of a pin's head to that of a pea. The larger nodules contain cheesy pus similar to that seen in cattle and pigs.

If the intestines are affected ulcers may be seen on the inner surface.

Treatment.

There is definitely no treatment for tuberculosis in cattle, pigs, or fowls.

Eradication.

As long as there is a tubercular animal on the farm there is a danger of the disease spreading to others. The same applies to the disease in poultry. As has already been mentioned, a good indication of the presence of the disease is condemnation of pigs after slaughter.

If the presence of the disease is detected in a dairy herd the only way to eradicate it is by the application of the tuberculin test to all animals over the age of six months and immediate slaughter of reactors. The whole herd should again be tested in six months' time, and if any further reactors are found the herd again retested in another six months. Usually, the disease disappears after the first test.

The Department has recently inaugurated certification of dairy herds as tubercle free and abortion free herds, the conditions of certification being defined in agreements drawn up for signature by the owner contemplating certification.

In accordance with these conditions, the owner agrees to submit his entire herd to the tuberculin test, which is carried out or supervised by a veterinary officer of the Department, and all cattle reacting to the test shall be disposed of in a manner approved by the Department.

If the herd is found free on the first test, the herd is declared tubercle free. The whole herd is retested every twelve months, and the herd is not declared tubercle free until a test of the entire herd fails to yield a reactor.

All cattle to be introduced into the tubercle-free herds must be tested before introduction, and any cattle from a certified herd allowed to run in contact with untested cattle must be retested before being brought back into the herd.

For the benefit of owners of show stock it is not compulsory for cattle to be retested following exhibition, before re-introduction to the herd.

A charge of 1s. per head is made to cover the cost of ear tagging, the method adopted for identification of cattle.

When a herd has been declared tubercle free, a notice to that effect, together with date of expiry of certification, appears in the "Queensland Agricultural Journal."

At the present time, ten herds, comprising a total of 562 head, have been declared tubercle free. In addition, several herds have been submitted and, though they have not yet obtained a clean test, are continuing under test and will ultimately be eligible for certification.

The attention of pure breeders is drawn to the certification of herds as a means of creating greater demand for their stock, as men with intelligence, when purchasing stock, must give preference to a stud comprising certified tubercle-free stock.

Men producing whole milk for human consumption should seriously consider the certification of their herds as a business proposition. It has been found that a definitely greater demand exists for milk from such herds, as apart from freedom from tuberculosis, the milk is of superior quality to that from herds not under supervision.

It has been found that pure breeders, and producers of whole milk for human consumption, derive most benefit from certification, and are desirous of, and in a position to, strictly adhere to the regulations requiring periodical retesting and rigid control of movement and pasture of stock in a tubercle-free herd.

Many applications are received from dairymen who either are unable, or do not desire to conform with the conditions set out in the agreement, but really desire a statement regarding the incidence of tuberculosis in their herds. Farmers who have suffered pig condemnations are the most important in this category, and every effort will be made to eliminate tuberculosis from their dairy herds, but such testing as may be found necessary will be at the discretion of the veterinary officer handling the case, and not necessarily in accordance with the tubercle-free scheme.

Dairymen contemplating the certification of their herds should not be misled by exaggerated stories of the percentage infection and subsequent monetary loss likely to be encountered. Though popular opinion places the average infection of dairy herds at ridiculous figures, in the vicinity of 25 per cent., owners may be reassured by actual figures, which reveal an average percentage more in the neighbourhood of 7 per cent. infection for coastal herds, and less than 1 per cent. for inland herds.

All persons desiring certification of their herds are advised to apply in writing to the Supervisor of Dairying, and every effort will be made to give the matter the immediate attention of a veterinary officer.

It is hoped in the near future to commence a scheme of tubercle-free areas throughout the State to ensure a supply of milk free from tuberculosis for human consumption.

In the case of fowls it is advisable to dispose of the whole flock for slaughter under proper inspection.

The Public Health Aspect.

Reference to the table at the commencement of this article will show that human beings are subject to both human and bovine types of tuberculosis, and also that pigs and fowls may contract the human type.

Thus cattle, pigs, and poultry affected with tuberculosis are sources of infection for human beings. This applies particularly when children are fed tubercular cow's milk, quite a fair percentage of cases of bone joint and glandular tuberculosis in children having been traced to this source. Adults appear to be more resistant than children to bovine tuberculosis.

Pasteurisation of milk reduces the danger of infection, but cannot be guaranteed to kill all tubercle bacilli present.

Thus tuberculosis is dangerous for both man and animals, and no effort should be spared to endeavour to eliminate it from our dairy herds, particularly when milk itself is being used for human consumption.

THE excellent rains received late in June and during the first week of July brought unexpected relief, particularly to the parched western areas. Practically the whole State benefited, the falls ranging from 1 to 7 inches.

The Darling Downs and Southern coastal areas received the lighter falls, which is an unusual feature of the winter season.

Farmers on the Downs, Lockyer, and the north and south coasts will now have enhanced prospects for wheat, fodder crops, and winter grasses, while potato planting will proceed under much more favourable conditions. Although some weeks must elapse before natural feed is available in the pastoral areas, water supplies have been replenished and a good spring is assured.

The practice of stocking pastoral lands to the limit of their carrying capacity during normal seasons is gradually bringing about a depletion of the natural grasses and edible scrub, so that a marked decrease in the number of stock carried will be inevitable, unless a radical change of policy can be introduced. Considerable improvement will be effected if grasses are allowed to seed periodically and belts of edible scrub planted in suitable locations.

Sugar.

Relatively dry, cool conditions ruled throughout July in all cane areas. These conditions have served to check growth and hasten crop maturity. Sufficient rain fell in every district to ensure the maintenance of an essential measure of moisture in the soil for both plant cane and the cane now ripening for the harvest. A good germination has followed this season's plantings. Most of the mills are now crushing, and the cane appears to be uniformly rich in sugar content.

Wheat.

The outlook for the present season is now much brighter, as heavy sowings have been made on good moisture. The Maranoa has benefited by the over-average falls, and although the sowing period was of necessity later than usual, it is still possible to harvest a good crop, providing conditions remain favourable. Cheques covering the payment under the Federal Wheat Bounty have been posted to all growers whose claims have been found in order.

It is of interest to note that the "Flora" variety, a high-quality Queensland wheat, was successful in winning the championship at the recent Sydney Royal Show, attaining the remarkable bushel weight of 69¼ lb. Flora is now one of the most popular varieties grown in Queensland.

Cotton.

The harvesting of the cotton crop is drawing to a close, only a limited number of consignments being received daily at the two ginneries operating. Fourteen thousand bales of lint have been ginned to the end of July, which is a very satisfactory yield considering the most adverse climatic conditions that mostly rule from mid-January onwards. While only moderate yields have been obtained generally, the improvement in average prices being received this season will make the total value of the crop and by-products nearly the same as that of the record one of last season.

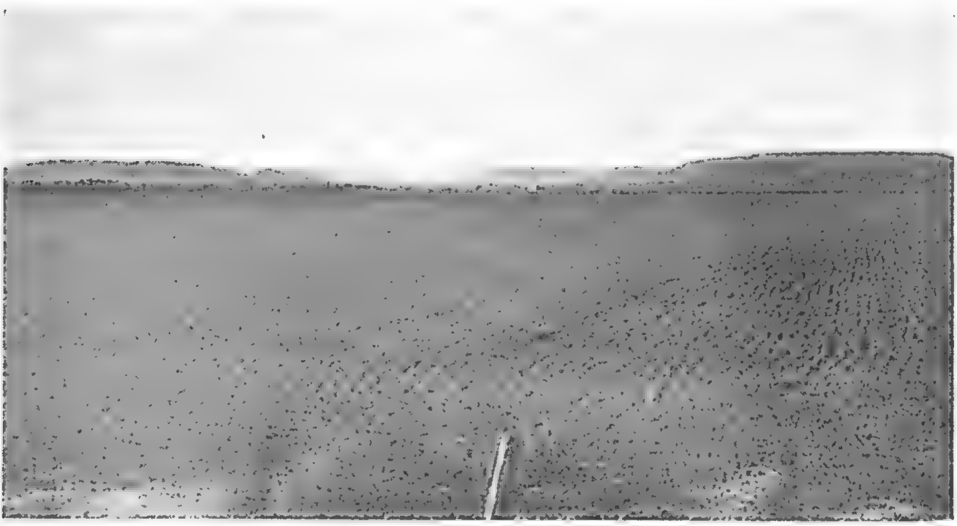

PLATE 34.—YOUNG WHEAT, DARLING DOWNS.

The results have greatly heartened the cotton-growers, and with the occurrence of the splendid soaking rains during the first part of July an increase in acreage can be anticipated in the coming season. Realising the value of early preparation of seed-beds, growers in all districts are hastening the ploughing of the old lands and also bringing in new cultivations to a considerable extent. The rate of arrival of seed applications also indicates the increased interest being taken in cotton-growing, and given suitable timely planting rains the coming crop should get off to a very satisfactory start.

The recent announcement of the anticipated requirements of the spinners for the next year makes the outlook very promising for obtaining attractive prices for the coming crop. It would appear that a considerable increase in production will be necessary to meet all requirements, and growers with suitable soils for the production of satisfactory yields of cotton should grow as large an acreage of this crop as they can cultivate properly.

Tobacco.

Interesting experiments have been carried out under the direction of the Council for Scientific and Industrial Research with the object of

controlling blue mould, at present the most serious disease with which growers have to contend. The essential feature of the treatment is the growth of tobacco seedlings in cold frames subjected to an atmosphere diffused with benzol. The initial results have been encouraging and warrant further trials.

Tobacco lands should now be ploughed and cultivated in preparation for the new season's plantings. In the south-west seed-beds are being prepared, but even in this district it is considered that the first week in August is sufficiently early for the sowing of tobacco seed.

Paspalum Renovation.

Paspalum dilatatum is the most important and widespread grass in the chief dairying districts, and it is a matter of concern that reports are now being received of the encroachment by mat grass (*Axonopus compressus*), particularly on the North Coast. It is well known that paspalum pastures deteriorate after a few years, and that a thorough ploughing, or renovating, plus the addition of fertilizer, is necessary to restore their original vigorous growth. Where ploughing is impracticable owing to standing timber, it is often possible to renovate portions of the area and apply the fertilizer as a top dressing. Experience in other lands points to the invasion by second-class grasses and weeds being primarily due to loss of fertility, brought about by the prolonged heavy stocking and consequent drain on the elements of soil nutrition. If this is proved to be the case no attempt at the eradication of undesirable species is likely to be successful, unless accompanied by the application of fertilizers and wherever possible by cultivation. On such cultivated land, the introduction of other desirable grasses and clovers then becomes a possibility.

Seasonal Farm Crops.

By C. J. McKEON.

POTATOES.

IN most potato-growing districts in Queensland growers are fortunate in being able to grow two crops a year, the first, which is usually sown in August, commonly known as the spring crop; and the second, planted in February, known as the autumn crop. Provided the soil and climate are suitable and good cultural methods are used, potato growing can be made more payable than most other crops; in fact, those who persist with the crop, and are not discouraged by occasional reverses as a result of disease or low prices, will find it one of the most profitable crops in the long run.

Potato Soils.

The best soil for potato growing is a friable, well-drained, alluvial loam, and one which is sufficiently rich in organic matter to absorb and retain the necessary amount of moisture. As a general rule, good lucerne land is also good potato-land; but this does not always apply, for lucerne can be grown successfully on the heavier classes of black soil which, unless under the best of conditions, are unsuitable for potatoes. Then again, potatoes can also be grown on some of the lighter sandy loams which could not be regarded as good lucerne land. Clayey soils and those which are badly drained and liable to become water-logged should be avoided, for not only are the chances of raising a crop small, but tubers of good quality cannot be produced on soils of this nature. Even on the best soils, high yields cannot be maintained where the land has been producing potatoes continuously for a number of years, unless care is taken to maintain the physical condition of the soil by keeping up the supply of humus. This can only be done by practising a rotation of crops or by ploughing in a green crop, preferably a legume, such as field peas for winter growth or cowpeas for summer growth. Farmyard manure, where available, is also excellent for this purpose, and also possesses considerable value from a fertilizing point of view.

Early and thorough preparation of the soil is essential to get best results from any crop, but to none does this apply more than to potatoes. Farmers who spend the extra time and labour required to put the land in first-class condition for potatoes will be more than repaid, especially if a dry spell is experienced during the growth of the crop. Under the most favourable conditions good crops may be produced on land that has received a hurried and rough preparation, but in any district the odds are greatly against these conditions occurring other than at rare intervals and, consequently, the necessity for thorough preparation of the land cannot be stressed too strongly.

The first ploughing should be to a depth of at least 9 inches, which will ensure that the seed when planted will have 3 or 4 inches of worked soil beneath it. The land should be left to fallow for a couple of months at least before planting time, care being taken in the meantime to deal with any weed growth which may appear. The use of a spring tooth cultivator or other suitable instrument will not only prevent weed growth, but will maintain the surface soil in good condition. Land prepared in this way will almost invariably be in a sufficiently good condition at planting time to ensure a satisfactory germination.

Varieties.

The question as to the most suitable varieties to grow is one that the grower himself will have to determine, either as the result of his neighbours' experience or by conducting trials of his own. Of the white-skinned varieties, Carmens and Scottish Triumphs are by far the most widely grown. Both are good yielding varieties and always command a good price in the markets. Up to Dates also do well in some localities, and come next in order of popularity. Of the blue-skinned varieties, Manhattans are at present the most popular, and are also the most reliable variety In certain localities Guyra Blues also give good results, but they do not do well in all districts. Satisfactions and Rough Skinned Brownells are the most widely grown of the red-skinned varieties; neither, however, should be planted in any quantity without a trial, as they only do well in certain localities.

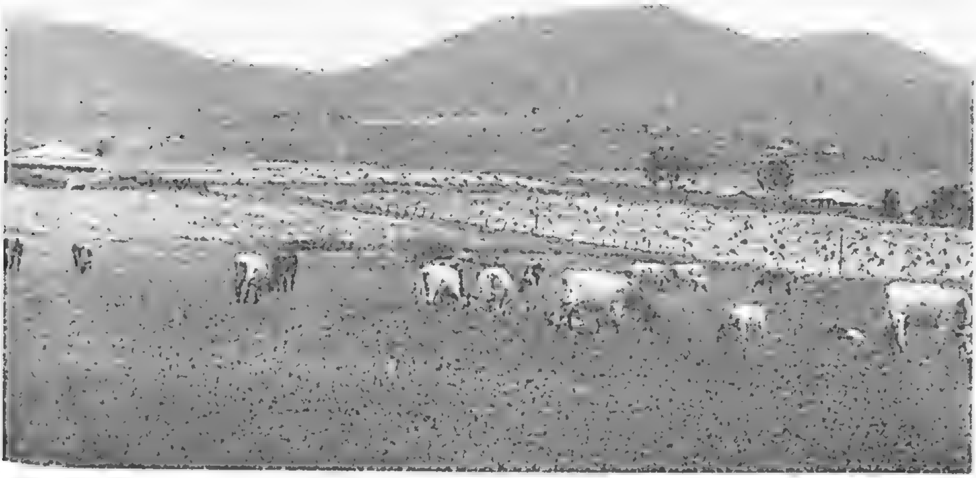

Plate 35.—In the Killarney District, South Queensland.

As growers are compelled, by reason of the fact that locally-grown seed is not available, to use seed which has been imported from the Southern States for the spring crop, supplies should be obtained from a reliable source. It is far better to get seed which will prove true to name of the variety which is known to suit the locality, even though it may cost a little more, than to obtain a cheaper line of seed which may turn out to be anything but the desired variety.

Providing the spring crop is planted early, seed from this can be used for planting the autumn crop in February.

All seed, especially that used for the spring crop, should be treated with formalin before planting, otherwise there is a serious risk of the introduction of disease. Anyone who may be interested in this treatment can obtain full particulars from the Department of Agriculture.

Tubers not perfectly sound or which, on being cut, show a suspicious looking discolouration should be rejected.

Seed for the spring crop may be cut, but this practice is not advisable in the case of the autumn crop, for hot, wet weather is frequently experienced during February, and, consequently, the cut seed is likely to rot in the ground. Where cut seed is used, the cutting should be done the day before to allow the cut surface to dry. Sprinkling with wood ashes is a practice which is adopted frequently, and it is a good one.

Much will depend on the size of the potatoes as to the best way to cut them, but as a general rule the smaller tubers should be cut in half lengthwise, and in the case of the larger tubers the stem end should be cut off at about a third of the length of the tuber, the remaining portion being cut through the centre lengthwise, thus making three sets.

Plate 36.—Field of Clover, Wootha, near Maleny, South Queensland.

Planting.

Although there are machines for planting, the general practice is to plough the seed in, the seed being planted in every third or fourth furrow according to the width of the plough cut. This practice has much to recommend it, as the furrows are not allowed to remain uncovered for any length of time and the seed can be spaced at an even depth and distance apart. The usual distance between the sets is, approximately, 15 inches at a depth of about 4 inches. They should be planted on the side of the furrow to prevent the horses tramping on them, as would be the case where they were planted along the bottom of the furrow.

The quantity of seed required per acre will naturally depend on the size of the tubers and whether cut or whole seed is being used, but, as a general rule, about 7 cwt. per acre is sufficient.

Cultivation.

The first cultivation should be carried out as soon as the young plants appear above ground. A light tine harrow, preferably a lever harrow with the tines set back, is the most suitable implement. This cultivation will not only break up the surface soil which may have become slightly caked as a result of rain following planting, but will also destroy any weed growth which has sprung up between the plants. This will be the last opportunity of doing this, for all future cultivations can only be carried out between the rows. The number of inter-row cultivations required will depend on seasonal circumstances, but should be sufficient to keep weed growth in check and, at the same time, keep the surface soil in a friable condition.

Plate 37.—Wheat Fields, Yangan Valley, Darling Downs.

When the plants reach the flowering stage they should be hilled; an effective and popular way of doing this is by fitting hilling attachments to an ordinary scuffler. The main advantages to be derived from hilling are that the tubers are protected from the potato moth, and it also prevents tubers which might otherwise have been exposed from becoming discoloured.

During growth every precaution should be taken to protect the crop against Irish Blight, and where there is a likelihood of this occurring, regular sprayings with Bordeaux mixture should be carried out. Frequently, sprayings are not commenced until the disease appears, and it is usually then too late. Spraying with Bordeaux mixture is purely a preventive and not a cure for the disease as many people imagine, and to be successful should be carried out before the disease appears. Full particulars of the preparation and use of Bordeaux mixture appear in a publication on potato diseases which may be obtained from the Department of Agriculture.

Plate 38.—Maize Silos at Atherton, North Queensland.

Harvesting.

In the case of the spring crop, harvesting is carried out usually as soon as it can be done safely, one of the chief reasons being a desire to get the potatoes on the market as soon as possible, for good prices are usually obtainable at the commencement of the season.

The hot weather, and the risk of damage by potato moth, also make it necessary to harvest the crop as soon as possible. In their anxiety to market their potatoes early growers frequently make the mistake of digging them before the skins are firm enough, with the result that they arrive on the market in a badly rubbed condition and consequently bring a reduced price.

Plate 39.—Mary River Crossing at Upper Kandanga, Mary Valley Line.

Harvesting is still done largely with a digging fork. A plough is also used at times to turn the tubers out, but although this is a quicker method than hand digging the crop cannot be harvested as thoroughly.

The tubers after being dug should not be left exposed for any length of time to the hot sun, and should be bagged and removed from the field as quickly as possible. When the potato moth is prevalent, on no account should the bagged tubers be covered with the tops or haulms while standing in the field, for this is one of the surest ways of introducing the moth to the bagged tubers.

When preparing them for market they should be graded carefully, for a nice, even-sized line of potatoes will command almost invariably a better price than an uneven sample. Care should also be taken to reject any tubers which are damaged or showing signs of moth infestation.

SORGHUMS.

Judging by numerous inquiries received from time to time by the Department of Agriculture for information on sorghums, there exists, apparently considerable confusion regarding the different groups. Those of importance as far as this State is concerned may be classified as follows:—Saccharine sorghums, grain sorghums, and grass sorghums. Broom millet, used for the manufacture of brooms, is also a member of the sorghum family. The saccharine or sweet sorghums are among the most valuable and widely grown fodders throughout the dairying districts of the State, and when cut at the right stage provide not only a nutritious fodder, but also a great bulk of fodder. The sweet juices contained in the mature stalks make them highly palatable to dairy and other stock. Although not quite so nutritious as maize, good crops of sorghum can be produced under conditions that would be fatal to maize. Sorghums also possess the advantage of remaining in a succulent stage for a considerable period after reaching maturity, whereas maize rapidly dries off on reaching maturity.

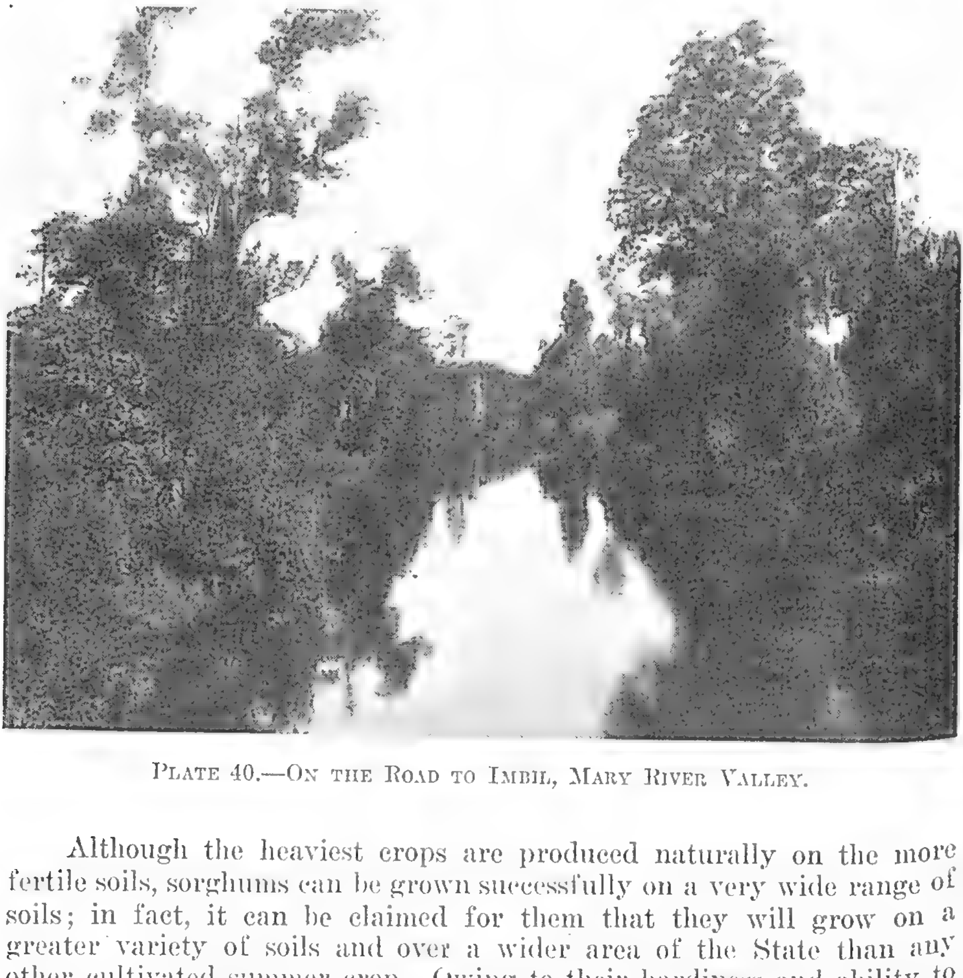

PLATE 40.—ON THE ROAD TO IMBIL, MARY RIVER VALLEY.

Although the heaviest crops are produced naturally on the more fertile soils, sorghums can be grown successfully on a very wide range of soils; in fact, it can be claimed for them that they will grow on a greater variety of soils and over a wider area of the State than any other cultivated summer crop. Owing to their hardiness and ability to withstand prolonged dry spells better than most other crops, they are of great value to stock owners during dry periods when there is a scarcity of grass or other succulent fodder.

Land Preparation.

To get the best results, it is just as necessary that the land should be prepared thoroughly prior to planting as for any other crop. Owing to their hardiness and their ability to thrive under adverse conditions, less attention is frequently paid to the preparation of the land for sorghums than crops such as maize, and while reasonably good crops are produced under these conditions, much heavier and more even crops will be obtained on well-prepared land.

Planting can be carried out at any time after all risk of frost is over and as soon as weather conditions generally are suitable.

Sowing.

The seed is frequently broadcast, but under average conditions this method is not nearly as satisfactory as sowing in drills. This applies particularly to districts where weed growth is prevalent, for it is not possible to keep weed growth in check while the young plants are becoming established. A broadcast crop is also much more difficult to harvest than one sown in drills, and the crop is also much more likely to lodge during wind storms; and where this occurs, particularly in a tall crop, it will remain down and tangled, thus increasing greatly the harvesting costs. The only advantage to be gained by broadcasting is that a finer stalk is produced. When sown in rows the usual spacing between the rows is about 3 feet, an ordinary maize planter fitted with a suitable seed plate being very satisfactory for the purpose. If no planter is available, furrows should be opened out with a single furrow mould-board plough to a depth of 4 to 5 inches and the seed dropped thinly by hand in the furrows. A light harrow should be then run along the drills to cover the seed.

Approximately 5 lb. of seed will be sufficient to sow an acre when sown in this way.

Cultivation.

Sufficient cultivation should be done between the rows during the early stages of growth to keep the soil in good tilth, and at the same time to check weed growth.

The crop is at its most nutritious stage when the grain is well formed, but still in the thick milk stage, and if the crop is to be used for converting into silage it should be cut at this stage. Where it is required for feeding in a green state, much of it will be naturally advanced much beyond this stage before it has all been cut, but it will still be of considerable food value even for some time after the leaves have been more or less killed by frost.

It is an excellent crop for silage, and when being harvested for this purpose the quickest and cheapest method of doing so is with a maize binder which cuts one row at a time and ties the stalks in bundles. Very few of these machines are in existence in this State, however, and the crop is usually cut by hand with a cane knife.

Varieties.

Numerous varieties of saccharine sorghums have been grown in this State at different times, but only a small number of the best of these have become popular.

Plate 41.—Picturesque Pomona, shaded by Cooroora Mountain.
Pomona is the busy commercial centre of rich dairy, fruit, and timber lands on the near North Coast.

Of the quick-maturing varieties, Early Ambér Cane is the most favoured, but it is a light-yielding variety when compared with some of the others, and for that reason is not grown extensively.

Saccaline is the most popular variety at the present time and has quite deserved its popularity. It is a tall growing, leafly variety which grows to 11 and 12 feet in height and takes approximately four to four and a-half months to mature. It also has the reputation of retaining its succulence for a longer period after being frosted than most other varieties. Unfortunately much of the seed now available shows signs of inoculation with other varieties, and growers who have pure seed should retain it for their own future requirements. Pure saccaline seed is of a brick-red colour.

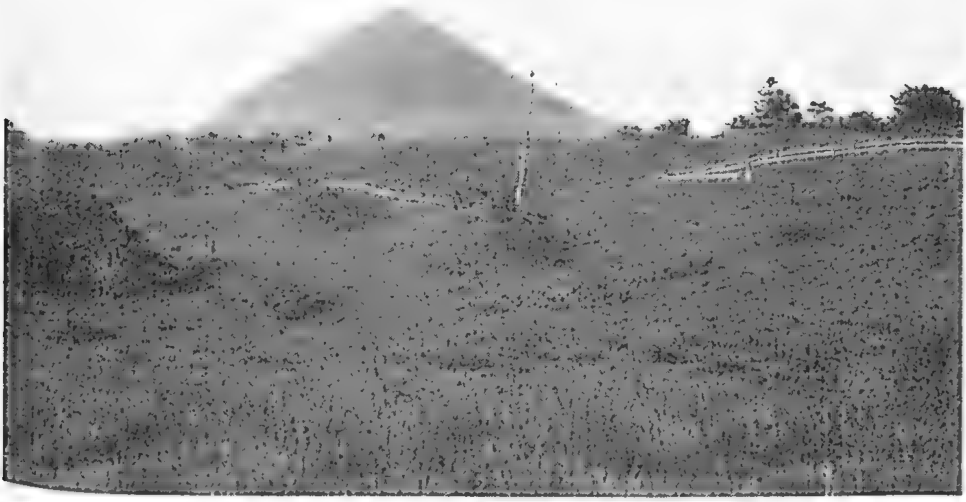

Plate 42.—Dairy Lands near Pinbarren Mountain, South Queensland.

Planters' Friend or Imphee.

This is a very old and favourite variety, and although not cultivated so widely as saccaline, still retains its popularity in some districts. It is a very heavy-yielding variety and grows, under good conditions, to much the same height as saccaline.

White African.

This is another tall-growing, heavy-yielding variety, but so far has not been grown to any extent in this State. In some of the coastal districts it has given excellent results during recent years and is increasing in popularity.

Honey Sorgho.

In the northern portion of the State a variety called honey sorgho has given very good results during recent years and is now much in favour. This variety, however, has never become very popular in Southern Queensland.

Grain Sorghums.

The grain sorghums are grown almost entirely for their grain and are not of anything like the same value for fodder purposes as the saccharine sorghums. The stalks do not contain sweet juices like the saccharine varieties, being of a more pithy nature. The yield of forage is also much lower. They are, however, capable of yielding large quantities of grain which in food value is almost equal to maize. They also have the advantage of being capable of producing a crop of grain on soils which are quite unsuitable for maize, and they are also capable of producing a crop under climatic conditions which would be fatal to maize.

The grain is of considerable value for poultry and stock feeding.

Harvesting.

Of the large number of varieties which have been grown in the past, feterita, standard milo, and cream milo have proved the best yielding and most suitable varieties. Red kaffir has also been grown fairly extensively. Any of the varieties mentioned are capable of giving a yield of sixty bushels of grain per acre under average conditions.

Regarding the grass sorghums, Sudan grass is the only one that is cultivated extensively, although in the past Johnson grass was also cultivated to some extent, but those who were unfortunate enough to introduce it to their cultivation paddocks have never ceased to regret having done so. Whilst it is an extremely hardy crop and also a very useful fodder at the right stage, it is extremely difficult to eradicate and becomes a serious pest. Sudan grass is a very valuable fodder crop and may be used for grazing off, converting into hay, or for silage purposes. It is particularly suitable for the more inland and drier districts, where it is now grown in preference to any other summer fodder crop.

Under reasonably good conditions at least three cuttings may be expected during the season. It is usually sown broadcast or with a seed drill. It is also sown in some districts in drills spaced wide enough to permit of inter-row cultivation being carried out. The quantity of seed required to plant an acre will vary from 5 to 15 lb. according to the method of sowing. Sowing should be carried out as soon as possible after the danger of frost is over, to permit of as many grazings or cuttings being made as is possible.

Harvesting has so far been done largely by hand. Where a suitable machine is available, the stalks may be cut and stooked in bundles until the grain is thoroughly dry. The heads are then cut off and threshed by a hackler or other suitable implement. Care should always be taken to see that the grain is sufficiently dry before being threshed and bagged; otherwise heating is likely to occur. The fact that so much hand labour is required for harvesting the crop has probably been the reason that grain sorghums are not grown more extensively in Queensland.

Grazing Risks.

Although Sudan grass is grown in very large areas each season and is frequently grazed in all stages of growth right throughout the growing period, there is always a risk in allowing stock on a crop before the flowering stage is reached. It will be admitted readily that thousands

of dairy stock are grazed on the crop each season, particularly in the Darling Downs and Maranoa districts, and suffer no ill effects. Cases of poisoning, however, do occur and serious losses result. For a very long time the general opinion was that pure Sudan grass was not poisonous at any stage of growth, and that poisoning of stock only resulted when grazed on crops which had been inoculated with other varieties of sorghum. This, however, does not appear to be the case, for in several cases that have been investigated there was no evidence that the crop was not pure. Past experience would appear to indicate definitely that the risk attached to grazing or on immature crop is very slight if the crop has been well grown. Where a crop has received a severe check from dry, hot weather and the growth is stunted, and this applies particularly to a ratoon growth, there certainly is a very serious risk attached to grazing the crop off before it flowers.

PLATE 43.—STACK BUILDING NEAR CLIFTON, DARLING DOWNS.

The saccharine and grain sorghums are very definitely dangerous before reaching the flowering stage, and while it is claimed that certain varieties are less poisonous than others, this has not yet been proved definitely, and consequently it is not advisable to take a risk with any of them.

SUMMER GRAZING CROPS.

Cowpeas.

As farmers are now busily engaged in preparing land for summer grazing crops, some of the most useful of these will be discussed briefly in these notes. One of the most valuable of these is cowpea, and although it has been grown for very many years and has proved conclusively that it will thrive over a wide area of the State and on a wide range of soils, it is not grown as extensively as it might be. Its value as a green manure crop is much more widely recognised than its value as a

fodder crop. It makes a highly nutritious hay, but it is not an easy crop to harvest and cure, and consequently is not widely grown for hay purposes.

For dairymen no more valuable crop could be grown for grazing purposes. Some difficulty is usually experienced at first in getting dairy stock to take to it, but once they acquire a taste for it they eat it readily, and its value as a milk producer will then be quickly demonstrated.

One of the best ways of getting the stock accustomed to cowpea is to make a light sowing of maize or other strong-growing crop amongst the peas. The trailing or twining varieties will twine round the maize stalks and the stock cannot avoid eating them while eating the plants of the other crop, and in this way will acquire a taste for them.

Cowpea can be grown on most classes of soil, provided the drainage is reasonably good, and it does not require any more favourable weather conditions than the average crop.

It will not thrive under cold conditions and should not be sown until all danger from frost is over. It is frequently sown broadcast, but sowing in drills is to be preferred. The usual width between the rows is 2 feet 6 inches to 3 feet with 8 or 9 inches between the plants. For broadcast sowing from one half to one bushel of seed is required to sow an acre, according to the size of the seed. When sown in drills from 5 to 15 lb. will be necessary.

When used for grazing purposes the cowpea not only proves a valuable milk-producing crop, but will greatly improve the soil after the residue has been ploughed under.

Where cowpea is grown solely as a green manure crop, difficulty will be experienced in satisfactorily ploughing under a heavy crop if the job is not carried out properly.

To do this successfully, the crop should be first of all flattened by rolling, and where a disc cultivator is available the process of ploughing the vines under will be more easily and effectively done if this machine is run over the rolled crop before commencing ploughing. The best stage at which to plough the crop in is when the pods have developed, but before they have started to ripen. A crop which has been allowed to mature too fully will become woody and consequently more difficult to plough under. As previously mentioned, properly cured cowpea hay is very nutritious and it is also very palatable to stock. In curing, a certain amount of care is necessary to prevent loss of leaf. To avoid this the cut crop should not be allowed to remain exposed to the hot sun for too long a period, and should be placed in loosely built cocks or heaps before the leaves become brittle. To effect an even cure the cocks should be turned occasionally.

The most favoured varieties are black and Poona. The black is a very old and popular variety which has proved to be a heavy cropper.

The Poona variety has come more into prominence during recent years and is now very popular in some districts. It is also a heavy cropper and can hold its own quite easily with the black variety in this respect.

Quite a number of different varieties are grown throughout the State, but the two varieties mentioned are the most widely grown.

Soy Beans.

Considerable interest has recently been shown regarding the growing of Soy beans. The Department of Agriculture has been conducting trials with these over a number of years, and while excellent results have at times been obtained the difficulty so far has been to secure varieties which will give consistently good results.

Other countries which are now growing them extensively experienced much the same difficulty at first, but once this problem has been overcome they have proved a valuable crop.

Although they are highly valued as a human food in countries of Eastern Asia, their chief value in this State, for some time at least, would be for fodder and soil improvement purposes.

The seed is valuable for its oil and also for the manufacture of soy bean flour, but it is doubtful if the seed could be produced here for the price at which it can usually be imported from countries where labour is cheap.

The plants contain a very high percentage of protein, and as they are palatable to stock either as a green fodder or in the form of hay, they would be of value for this purpose alone.

They also have a beneficial effect on the soil, and in countries where they do well are greatly valued for this purpose.

The results of the trials so far conducted would indicate that this crop will grow on most reasonably good soils provided the drainage is good. The young plants are fairly tender, and for that reason the surface soil should be well worked and should not be allowed to become caked prior to germination. Once the plants are established they are fairly hardy and will stand a dry spell as well as most other crops. They are susceptible to frost, and sowing should therefore be delayed until all danger of frost is over.

The seed should be sown in rows spaced at least 2 feet 6 inches apart with about 6 inches between the plants. They should not be sown deeply, a depth of 3 inches in a well-worked soil being sufficient. The seed of the different varieties varies greatly in size and consequently the quantity of seed required to sow an acre varies. Approximately 5 lb. of seed is sufficient for the small-seeded varieties and about 10 lb. per acre for the large-seeded varieties.

If the crop is being grown for hay purposes it should be cut when the seeds are about half formed.

To prevent loss of leaf the same care would be necessary in curing the crop as would be the case with cowpeas.

A crop that is grown for seed should be cut when about three-quarters of the pods are ripe. The pods do not all ripen at the same time, and if the cutting were delayed until all the pods had ripened many of those which ripened first would have shed their seed. The seed should be allowed to dry out thoroughly before being threshed and bagged, as it heats very readily where this is not done.

Regarding varieties, a large number have been tried so far, and those which have shown the most promise are Otootan, Biloxi, and Laredo, particularly the two former. Otootan is the most leafy and lightest stalked of these varieties, and shows distinct promise as a fodder variety.

The other two varieties are also tall-growing, leafy varieties, but are not as fine-stalked at Otootan.

From a grain point of view, Biloxi would probably prove the most suitable variety. These are fairly-late-maturing varieties and should be sown not later than November in the coastal districts and earlier than that in districts where early frosts may be experienced.

Of the quick-maturing varieties, none has shown more promise than one known as A.K. 2. This variety was introduced some time ago by the Ford Motor Company, and the seed was kindly forwarded to the Department of Agriculture for trial purposes.

PLATE 44.—FIELD OF MAIZE, IMBIL, MARY VALLEY.

To save any disappointment to those who may wish to secure seed of Soy beans it is as well to point out that until something more definite is known regarding the suitability of the different varieties only sufficient seed is being retained for experimental purposes. No variety has yet given consistently good results to recommend their growth in preference to cowpeas.

Millets.

For a quick-growing summer grazing or hay crop, particularly for the coastal districts, the millets, or what are commonly known as paniciums, have proved the most suitable. They can be grown on almost any soil that could be classed as worthy of cultivation.

They are usually sown broadcast at the rate of 12 to 15 lb. of seed per acre. They can be sown as soon as frosts are over and, given favourable weather conditions, will provide good grazing within five or six weeks from the time of sowing. They should not, however, be grazed

too early but should be allowed to reach a height of 8 or 9 inches when they will have usually a sufficiently strong root growth to stand grazing. If the crop is not allowed to become too mature before being grazed, a good second growth will appear, which can either be used for grazing purposes or for converting into hay.

When being used for hay the crop should not be allowed to mature the seed, but should be cut when the grain is forming.

Apart from the loss of food value in an over-matured crop, most varieties shed their seed freely, and this will germinate freely the following season. This would be of little consequence where the same land was again required for this crop, but where a crop such as maize or potatoes was to be grown, extra work would be entailed in cultivation to deal with the volunteer growth.

It will be found that most varieties dry out more slowly than most other hay crops, but when properly cured make a very nutritious hay.

They are also of value for silage purposes either for mixing with a heavier-stalked crop such as maize or sorghum or for using alone.

When used for this purpose the crop is much more easily handled both in the field and while being ensiled if cut with a reaper and binder.

Of all the varieties grown, white panicum and Japanese millet have given the best all-round results. They not only have proved to be heavier yielders, but are better stoolers and provide better grazing.

The best of the other varieties are Hungarian and Manchurian millet and what is commonly called giant panicum or liberty millet.

EXPIRED SUBSCRIPTIONS.

A very large number of subscribers to the Journal expired in June and July, and have not been renewed. A further large number expires with this issue.

Subscribers whose term expired in June and July have been continued on our mailing list, and a yellow wrapper on this month's Journal (August) is an indication that their subscriptions are now due.

Subscribers whose term expires with this issue are reminded similarly.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Poona Pea as a Green Manure.

THE use of Poona pea as a green manure is rapidly becoming popular in the cane areas of North Queensland. The accompanying photograph shows a splendid crop on the farm of Vessy and Sons, Edge Hill, Cairns. The soil is of a schist nature, and Poona pea is found to give better results than other green crops on this class of country.

Plate 45.—An Excellent Crop of Poona Pea at Edge Hill, Cairns.

The advantages of this particular green crop may be summarised as follows:—

1. Quick and certain germination;
2. More succulent than Mauritius beans, and consequently easier to plough under;
3. More resistant to bean fly than cowpea;
4. Gives crop under adverse conditions;
5. Higher value in supplying nitrogen than other crops;
6. Cheap to grow; seed costs 12s. 6d. to 17s. 6d. a bushel, which will take care of at least four acres.

Most farmers during the past season made the mistake of planting too thickly. From 12 to 15 lb. per acre are recommended, but as the seed is very small, care must be taken in broadcasting, otherwise this amount will be exceeded.

Up to the present the chief disadvantage shown by Poona pea is its tendency to come to maturity too quickly, especially when planted in rich soil. Further, if allowed to mature seed before ploughing under, subsequent germination may be troublesome to control after the young cane has been planted. It is, however, not nearly so difficult in this respect as Mauritius bean.

"G.B." in the "Cane Growers' Quarterly Bulletin" for July (Bureau of Sugar Experiment Stations).

Plate 46.—View from Noosa Lookout, showing Noosa River, Weyba Creek, and Cooroy Mountain, South Queensland.

Irrigation in North Queensland.*

DURING the past summer several new irrigation plants were installed in North Queensland. Most of these were actually in operation in the Tully area, reputedly the wettest area in Queensland. In common with all other Northern cane areas an unusually long dry spell took the place of the normal wet season and the cane suffered severely. Those growers who were able to apply water to their crops during this period will reap a marked benefit in increased yields, and it is fairly safe to assume that the results which would accrue from adequate irrigation in a season such as this would be sufficient to cover the major portion of the costs of the installation.

It is not suggested that irrigation should be regarded as an economic means of producing surplus sugar. Rather is it to be considered as a means of ensuring consistent crops, and the results of the past three years show definitely that it is practically an indispensable aid to any rational crop regulation scheme.

The accompanying photographs were taken on the farm of Mr. E. Sues, of Gordonvale, who was the first grower in the far North to put in a pumping plant. It consists of a 7-in. centrifugal pump, with 9-in. delivery, driven by a 25-h.p. electric motor. It is reckoned to deliver

PLATE 47.—SHOWING CENTRIFUGAL PUMP.

60,000 gallons of water per hour. The water is drawn from the Mulgrave River, and is of excellent quality. The water is conducted through a pipe line of reinforced concrete.

* From the "Cane Growers' Quarterly Bulletin" for July (Bureau of Sugar Experiment Stations).

Plate 48.—Showing Discharge Tank and Distribution Mains.

That portion of the crop which was irrigated during the dry months demonstrates in no uncertain manner the benefits of the treatment, and will cut many tons to the acre in excess of similar cane which was dependent on natural rainfall.

Plate 49.—The Road to Skyring's Creek Skirts the Base of Cooroora Mountain, South Queensland.

The Cotton Industry

COTTON ROTATIONS.

By W. G. WELLS, Director of Cotton Culture.

THE necessity of discontinuing the practice of growing successive crops of cotton over a period of several seasons on the same site is becoming more apparent each year on all soil types. One of the most obvious reasons is that cultivation costs are considerably increased through the greater number of operations required to combat the excessive weed growth on the old cultivations, particularly where the pigweed is a pest. Investigations carried out in recent seasons have shown that certain chemical and physical changes are occurring in the soils with the continuous cultivation of cotton on the same land that also make it imperative that this practice be stopped, and it is the purpose of this article to draw attention to these factors.

Changes in the Chemical Composition of the Soils.

The intensive cultivation of a soil over a series of years stimulates the bacteria in it, which assist in the decomposition of organic matter such as all parts of grasses and plants that become mixed with the soil. One of the products resulting from these "breaking down" operations is the plant-food nitrate—nitrogen—which is very essential for the proper growth of plants. The fodders and grasses all require large amounts of nitrates for successful growth, but the cotton plant produces better with limited amounts, or where there is a wide ratio between the carbon and nitrogen content of the soils. Carbon is the basic material of all organic matter, and the ratio between the carbon and nitrogen content of soils appears to play a most important part in the fruiting ability of plants. A survey made of some of the main soil types of the cotton areas has shown that, broadly speaking, the soils which can be relied upon to produce good yields of cotton under favourable climatic conditions have wider ratios of carbon to nitrogen than do those on which poor yields are generally obtained.

When virgin country or grass land is brought into cultivation the nitrate content of the soil is usually very low; the initial determinations of most cotton soils generally give under 12 parts per million with an occasional sample of very fertile soil as high as 15. Adjacent soils of six or seven-year-old cotton cultivations may range as high as 30 to 40 parts of nitrates per million, depending on the time of year they are taken. When these soils are held under optimum temperature and moisture conditions for 28 days the new cultivations seldom increase to as much as 30 parts of nitrate, whereas the older more fertile cultivations have recorded as high as 60 parts of nitrate per million parts of soil.

This tendency for the nitrate content of the older cultivations to increase under optimum conditions, which are warm temperatures and well moistened soil, explains the results that are often obtained on the older cultivations of the alluvial loams and clay loams. During the 1934-35 season the nitrate content of such soils on the Cotton Research Station averaged around 8 to 10 parts per million in the dry spring months. With the advent of frequent rains and hot weather the nitrate content rose very quickly, and in 28 days had reached 26 parts per million. During this period the plants which were entering the squaring period grew so rapidly and rankly that only limited squaring developed. Had a normal "wet season" been experienced after that undoubtedly a very rank growth of plant, accompanied by excessive and continuous shedding of squares, would have resulted. Fortunately a sudden hot dry spell occurred instead, which checked plant growth and nitrate manufacture, and within three weeks a heavy crop of squares was being produced on all plantings. Dry conditions, broken only by hard beating storms which mostly ran off, wetting only the surface soil layers, ruled for the rest of the season, so that the moisture and nitrate content of the soils was steadily lowered. There was a slight increase in the nitrate content of the surface soils following each rain, however. It can be appreciated, therefore, how quickly the nitrate content of the fertile soils of the older cultivations may increase, and what effect the same may have on crop production.

Changes in the Physical Condition of the Soils.

The decrease in the amount of organic matter which accompanies the increase in the nitrate content has a marked influence on the physical condition of the soils. With the lowering of the organic matter content, the soil particles tend to adhere together to a greater degree, which in the clay soils eventually results in their setting into such a hard mass during beating storms that little penetration is obtained afterwards, except with steady soaking rains. Soil in such state breaks up into large clods when ploughed unless it is in exactly the right moistened condition. Sieving tests of two and nine-year-old cultivations of a clay loam soil, which were carried out at the Research Station, demonstrated that a greater percentage of soil, by weight, broke up into clods during the ploughing of the oldest cultivation, that would not pass through a 1½-inch mesh. The older cultivation also broke up into fewer of the finer particles that would pass through an ⅛-inch mesh.

This tendency for the older cultivations to set into hard masses which are penetrated to any depth by only steady soaking rains is one of the most serious problems facing the farmers of this State. A good

percentage of the total rainfall received in most of the agricultural areas outside of the cane-growing districts of the North occurs in the form of storms rather than general soaking rains. In some instances as much as 4·25 inches have fallen in less than three hours, and often around an inch in under an hour has been recorded at the Cotton Research Station. There is a big run-off of such rains under the best of soil conditions, but where crops are grown on the older hard cultivations undoubtedly small benefit is obtained from such storms. This is evidenced by the results obtained in soil-moisture studies at the Research Station. In the 1932-33 season a total of 2·94 inches, occurring in two storms, one late in the evening followed by the other early next morning, failed to increase the moisture-content of the 4-6-inch soil level on well-mulched old cultivation to any appreciable extent—plants on any little high spots wilting in the afternoon within six days. In the following season it was demonstrated that with a continuous rain over twenty-five hours, yielding 2·46 inches, only 35 per cent. of the rain penetrated into the first 18 inches of soil in an eight-year-old cultivation, as compared to 74 per cent. in a two-year-old. During the 1934-35 season fortnightly determinations were made on adjacent blocks of three, six, and nine-year-old cultivations. The results obtained are shown in Plate 50.

The relative effect of ploughing during a dry spell is clearly indicated in the marked lowering of moisture content in all of the cultivations in the plough depth of the upper 6 inches. The good soaking rains occurring after the planting period apparently tended to set the oldest cultivation, for even the good storm group of December failed to bring the content of the 10-12-inch depth up to those of the other cultivations, as was also true in the 4-6-inch level.

Rotations of Crops Necessary.

It is apparent, therefore, that the growing of successive crops of cotton on the same land over a series of years brings about undesirable chemical and physical changes in the soils. It thus becomes necessary for cotton-growers to examine all possible cropping systems which will provide a suitable rotation with cotton-growing to prevent these soil deteriorations occurring. The advantages of growing cotton on new cultivations out of the virgin state have been discussed previously.* Naturally the size of the farms limit the extent to which this procedure can be adopted, but fortunately it appears that very satisfactory results can also be obtained by growing cotton in rotation with Rhodes grass. Some gains may also be realised by growing cotton in rotation with maize and fodder crops, particularly the latter on the less fertile clays and clay loams. The results that have been obtained with these different rotations will next be presented.

New Cultivations.

The value of new cultivations for cotton-growing is becoming more appreciated by growers, and there has been a decided tendency during the last season to bring more virgin country into cultivation, both in forest soils and in scrub country where the stumps of the original burn have rotted sufficiently to allow of economical clearing for ploughing.

* Cotton Growing on New Cultivations, by W. G. Wells, Director of Cotton Culture, "Queensland Agricultural Journal," April, 1934.

The results realised on the newer cultivations have generally been satisfactory, even under the low rainfall and higher temperatures which ruled throughout most of the latter half of the past season. Such conditions have favoured the older cultivations to some extent, for there was little tendency to develop rank growth of plant, and their

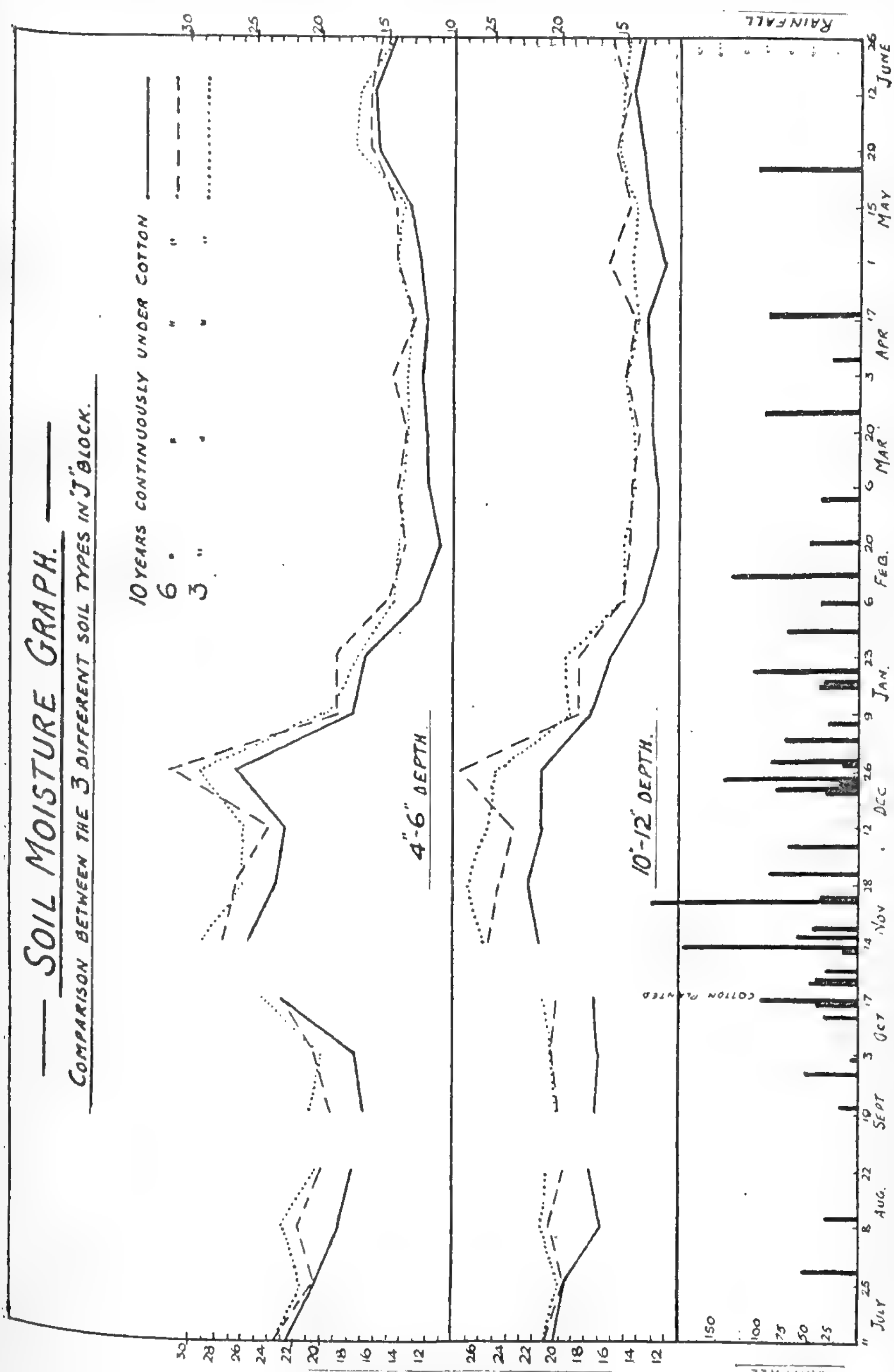

PLATE 50.—Graphs showing percentage of moisture in the 4–6 and 10–12 inch levels of three ages of cultivation. (Soils oven-dried at 100 deg. C.). Soils ploughed August 13-22. Differences of over 2 per cent. of moisture are significant statistically.

higher nitrate content helped to counteract the lesser moisture existing during the critical stress periods of the formation of the crop that was harvested.

Efforts were made to obtain as many illustrations of the relative yielding ability of the soils as possible, but unfortunately only a limited number of cases were found where strictly comparable results could be secured. The yields of the two adjacent acres were obtained in each case, and 80 lb. of representative seed cotton of each was forwarded for separate ginning and fibre examination. The results are presented in Table I. to show the range of soils and districts and the degree of gain realised.

TABLE I.

District.	Variety.	Soil Type.	Yield lb. Seed Cotton. New Cultivation.	Yield lb. Seed Cotton. Old Cultivation.
			Per acre.	Per acre.
Scoria, Callide Valley	Lone Star	Reddish-brown clay loam originally on ironbark covered slope	606	554
Goovigen, Callide Valley	Indio Acala	Greyish-brown clay loam flat originally timbered with ironbark and box trees	578	524
Jambin, Callide Valley	Indio Acala	Brown loam flat originally timbered with ironbark and box	1,012	927
Wowan	Indio Acala	Brown sandy loam to loam originally gum and ironbark forest	2-year old 800	Old cult. 500

The results indicate slight gains on the less moisture-retaining soils, and good gains on the better soils being obtained in favour of the new cultivation in each instance. It is unfortunate that more similar comparable data could not be obtained. Many instances were noted where the same variety produced higher yields on newer cultivations than on the old cultivations in the immediate district. The results were not strictly comparable, however, owing to the possibility of slight soil variations, &c., affecting the yields, and are therefore not presented.

The examination of the fibre indicated that no detrimental effect had been experienced on the newer cultivations, and in some instances the fibres were stronger and of better character and colour. There was no consistent trend in the differences obtained between the ginning percentages, there being slight deviations in favour of each age of cultivation. It is believed, therefore, based on the results of the limited number of comparisons, that there was no marked difference in the value of the seed cotton produced on either new or old cultivations under the climatic conditions of this past season, which tended to level the yields and quality of many of the varieties.

Effect of Age of Cultivation.

An experiment is being carried out at the Cotton Research Station in which five varieties, representing a wide range of types varying from open quick-maturing cottons suitable for good conditions on fertile soils, to drought resistant ones more suitable for the drier districts or the

harder soils of the districts of good rainfall, are being grown on soils of different ages of cultivation. The results obtained from the first three seasons of the experiment are given in Table II.

TABLE II.

Season.	Yields per acre in lb. Seed Cotton.		
1932-33—Uniformity trial of one variety	1-year cult. 917	4-year cult. 501	8-year cult. 251
1933-34—Latin square of five varieties	2-year cult. 1372	5-year cult. 1313	9-year cult. 1236
1934-35—Latin square of five varieties	3-year cult. 936	6-year cult. 978	10-year cult. 911

The differences in the mean yields for each age of cultivation show how varying seasonal conditions affect the results obtained on the same soil sites. The 1932-33 season was one of light rainfall following a season of drought conditions. The crop had a "hand-to-mouth" existence, as it were, and the crops on the more open-textured newer cultivations undoubtedly obtained greater benefit from the rains that occurred. Very serious corn-ear worm attacks were experienced in mid-season, particularly on the oldest cultivation, where heavy loss of crop resulted that was followed by very rank growth of plant. The 1933-34 season was characterised by the greatest winter rainfall in sixty years, with ample rains for the rest of the season, except a rather marked dry period at mid-season. Plant growth was remarkably small in all cultivations, the nitrate content being low all season, and practically no insect attacks were experienced. Under the circumstances all five varieties produced the heaviest crops on the oldest soils, where the higher nitrate content assisted crop development.

The climatic conditions of the 1934-35 season have just been described in the discussion of the development of the nitrate content of the soils for this season. Although the mean yields of all varieties are in the order shown in Table II., three out of the five varieties had heavier yields on the 3-year cultivation than on the 10-year, with three of the five having the heaviest yields on the 6-year cultivation. The two varieties having higher yields on the 10-year than on the 3-year cultivation were a big boll type suitable for wet districts and a rather later-flowering variety which normally has a large vegetative structure that produces a heavy top crop. The higher nitrate content of the older cultivations would assist both of these varieties, particularly the latter one, which produced its highest yield on the 6-year-old cultivation.

The results obtained so far from the experiment have shown marked differences in yields occurring between the different ages of cultivation, according to the season. It is pointed out, however, that there has been practically no corn-ear worm attacks during the last two seasons, with the usual resultant rank growth of plant. Also, late seasonal conditions have not been conducive to promoting rank growth. The conditions have been rather unusual, therefore, and not favourable for the newer cultivations. Undoubtedly the rank growth that frequently follows the loss of crop during a corn-ear worm attack on the older cultivations of high nitrate content is a very serious factor in successful cotton-growing in many of the districts. Although severe losses may be experienced on the newer cultivations, the lower nitrate content does

not promote luxurious growth after the loss of crop has occurred, and when the attack ceases a profitable crop is quickly developed if weather conditions are at all favourable.

Rhodes Grass.

The yields that have been obtained where old Rhodes grass sowings amongst the stumps of the original scrub burns have been brought into cultivation have led to investigations into the merits of the Rhodes grass—cotton rotation being carried out on forest soils at the Cotton Research Station. During the past two seasons results have been obtained that indicate this is a rotation that all growers should try. In the first season of cotton after only two years of growth of Rhodes grass on six-year-old cotton cultivation, a gain of 30 lb. of seed cotton per acre was obtained, following Rhodes grass, in early planted cotton, and 40 lb. in a late planted experiment. Very clear evidences of a lack of nitrates was noticeable during the first half of the season in the cotton following the Rhodes grass which may have checked the development of crop, as the plants were smaller and of a more restricted type than those in the cotton-cotton plots. The unusually heavy rainfall in the first half of the season undoubtedly caused excessive washing down of the nitrates in such open soils. In the 1934-35 season the experiment was harvested so as to show the effect on different soil types. The crops following Rhodes grass outyielded the cotton following cotton plots by 124 lb. seed cotton per acre on flat very fertile alluvial clay loams, and by 80 lb. per acre on a slight sandy clay slope with low moisture-holding capacity, which also tends to set very hard following severe storms after the last cultivation.

Investigations were also carried out into the hay producing ability of Rhodes grass in its second year of growth on alluvial forest loams which had previously grown cotton for eight years. Upwards of 2 tons of a good class of hay were produced per acre even under the adverse mid-seasonal conditions. Analyses also showed that Rhodes grass reduces the nitrate content of the soils outstandingly—all samplings of the last two seasons in growing crops of Rhodes grass showing practically no nitrates present in either of the first or second six inches of soil.

It would appear, therefore, that the practice of growing Rhodes grass on the old cotton cultivations for three or four years and then following with cotton for the same period is one that every cotton-grower should try out, particularly on soils of high nitrate content. It is possible that on the harder clay soils of naturally low fertility it may be more advantageous to rotate cotton with annually sown fodder crops such as Sudan grass and panicum. Both are quick growing, and can be sown at the start of the wet season and make a good yield of hay under average seasonal conditions. By ploughing early in the autumn after these crops full advantage of the winter rains is obtained, and in addition the stubble decomposes fast enough so as to prevent any deficiency of nitrate manufacture during the growth of the following cotton crop.

Cotton-Fodder Crop Rotations.

A series of rotations in which Sudan grass, giant panicum, saccaline, sorghum, and maize are grown alternately with cotton, and also longer ones, such as wheat-maize-cotton, oats-maize-cotton, &c., is being carried out at the Cotton Research Station. Some of the rotations have not been conducted long enough to allow of thoroughly indicative results

being obtained. No consistent gains have resulted from any one rotation, however, and the mean gain of all treatments shows only a slight superiority over the cotton-cotton controls. Generally speaking, the most gains have been obtained in the drier years, when cotton followed fodder crops grown in wet seasons—there apparently having been a reserve of subsoil moisture left for the deep roots of the cotton plants. In wet seasons the yields of all plots have been surprisingly alike, or in several instances

PLATE 51.—SHOWING SET, OLD CULTIVATION.

Soil of a 10-year-old cultivation. Note the compact set appearance. The water from hard storms mostly runs off such soils, which "set" so quickly that easy penetration is very soon prevented.

the cotton following early ploughed panicum stubble has been outyielded by the cotton-cotton plots. Investigations carried out this past season indicate that the panicum stubble is quickly decomposed where it is ploughed before the late summer rains cease. Fortnightly nitrate determinations showed an increase in nitrate content within a month on both summer and early winter ploughing of the stubble, but a greater rate of production in the earlier ploughed plots, which was maintained well into the following mid-season. The soils were of a fertile nature of good nitrate content, so it is possible that all fodder stubbles are digested too quickly to obtain sufficient reduction of nitrate production to affect materially the growth of following cotton plants. On soils of lower nitrate content a slow enough rate of decomposition may take place to allow the stubble to improve the texture of the soils somewhat, but still have sufficient production of nitrates to promote good growth of cotton.

Value of Rotations to Reduce Soil Erosion.

It is a matter of experimentation for each grower to ascertain the most profitable cropping system for his various soils. It is absolutely necessary, however, that some form of crop rotation be adopted which will improve the physical condition of the soils so that greater penetration of severe storms can be obtained. This will not only increase the yields of cotton, but will assist in retarding run-off of the rain water actually falling on the field. Where cotton is grown in rotation with fodder crops the plantings of fodders or grasses can be arranged in alternate

strips with the cotton, which reduces the flow of the run-off and accompanying soil losses to a remarkable extent. Experiments in the United States of America have shown a most pronounced reduction in soil and moisture losses where cotton is grown in rotation with fodder crops as compared to continuous cotton. The losses of soil and accompanying plant foods are appalling where cotton follows cotton for several years on certain classes of soils of that country.

PLATE 52.—SHOWING STUBBLE IN NEW RHODES GRASS CULTIVATION.

Soil at the end of the first cotton season following two years of Rhodes grass. Note the grass stubble that is still on the surface, and also the more crumbly nature of the surface. A field in this condition absorbs a greater amount of storm rains, as the run off is retarded, thus allowing of better penetration.

Similar losses are occurring in most cotton districts of this State. In one investigation of a loamy scrub soil it was ascertained that, on the lower portion of the slope, soil of over 6 inches in depth had been deposited from the upper levels. This section of the field was really too fertile for successful production of the variety of cotton that was required for the upper slopes, which had been denuded of much of their fertility during only four years of cultivation. On some places in the older sections of the south-eastern part of the State, forty to sixty years of farming without paying attention to proper rotations, ploughing and planting row crops up and down the slopes instead of on only slight grades across them, and failure to divert the flow of water from adjacent fields, have caused the loss of all the originally very fertile scrub surface soils. Crops are now being grown on the poorer subsoils, which require frequent rains to produce even moderate yields. From any hill top the various coloured subsoils now show up in every field, and it is but a matter of time, if soil-improvement methods are not soon adopted, before these soils will become so infertile as to make farming of any kind unprofitable. Cotton-growers in the newer districts are therefore urged to adopt methods of crop rotations and planting across the slopes of their cultivations, which will make cotton-growing more profitable, maintain the physical condition of their soils, and save the fertile surface soils which are the product of the forces of Nature operating over hundreds of years, and are irreplaceable.

THE LITCHI.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE Litchi is a member of the Nephelium genus, of the order Sapindacea, and is known botanically as *Litchi chinensis* (Sonn.) or *Nephelium litchi* (Cambess.).

In suitable regions and under good conditions the tree may grow to a height of about 40 feet, and is very ornamental. It has a compact, round, broad top, thickly furnished with glossy bright-green old foliage, and light-green, yellowish or pink young growth. The leaves are compound, being composed of two to four pairs of leaflets, oblong-elliptic to lanceolate, glabrous, and about 3 inches long.

The flowers are small and borne in terminal panicles, similar to the mango. The fruit which follows is in loose clusters of three or four up to twenty or twenty-five, and is oval to ovate up to $1\frac{1}{2}$ inches long. The rind or skin is thin and warted, green when the fruit is young and gradually, in most varieties, changing as it matures to yellow, and finally when quite ripe to a magenta red. One variety, however, retains its green colouring when ripe, and one or two others retain a bright yellow colour. As the fruit progresses to the over-ripe stage the rind becomes brown.

Under the rind of the fruit is a white membranous skin covering the flesh beneath, the latter botanically known as the arillus. This is whitish, translucent and jelly-like but firm, and has a flavour slightly sub-acid.

The seed enveloped in the aril is glossy dark brown, frequently small and shrivelled in the better varieties..

The name of the tree is variously spelt Litchi, Lychee, Leechee, Lichee, &c., but Litchi is generally accepted, following its botanical name. The pronounciation varies, but in the region of China where it is grown ly-chee is the pronounciation and this is generally accepted.

The native habitat is generally agreed to be Southern China, but as it has been cultivated for 2,000 years or more its origin is more or less obscure. In China the country round Canton is considered most suitable for litchi growing and the industry is chiefly concentrated round that region.

According to Alphonse de Candolle India has been growing litchis for approximately 200 years. Commercial orchards are now flourishing in several districts, but production is not as extensive as in China. Cochin-China, Burma, Hawaii, and other places grow the tree on a limited scale.

In Queensland the introduction of the litchi dates back to 1854, when plants were obtained from the Sydney Botanical Gardens. In the later fifties the tree was planted in the Brisbane Botanical Gardens (ref. J. F. Bailey, "Introduction of Economic Plants into Queensland"). Towards the end of last century and in the early years of the present century a number of trees were imported and planted in North Queensland and many of these are still flourishing.

However, litchi growing has never assumed the proportions of even a small industry in Queensland. Probably the difficulty in obtaining plants, coupled with the long period required for seedling trees to reach maturity, and the uncertainty of their being good varieties when they did mature, has deterred many from embarking in their cultivation.

Soil and Climate.

In soil requirements the litchi prefers rich alluvial loams, but it is fairly adaptable, and W. Popence reports it as being grown successfully on light sandy loams in Florida.

Whatever the type of soil, however, copious soil moisture is strictly essential, and if it is naturally lacking it must be supplied artificially. Drying out of the soil is a fatal handicap to successful litchi growing, for although the trees may not be killed outright (except in extreme instances) they are so slow growing, ragged, deficient in foliage and generally sickly that profitable results are impossible.

A humid atmosphere appears also to be advisable, although not strictly necessary as is proved by the commercial growing of the trees on the plains of Northern India under fairly dry atmospheric conditions.

Yet one more point should be borne in mind in selecting a site for a litchi orchard—that is freedom from frost. Cool conditions are not considered harmful as may be proved by the successful growth of several trees around Brisbane for many years. Heavy frosts are, however, definitely deleterious, and young trees are delicate in even light frosts.

There are therefore four main conditions to be noted in considering the establishment of a litchi orchard, if the best results are to be obtained. They are (*a*) plentiful soil moisture, (*b*) rich alluvial loamy soil, (*c*) humid atmosphere, and (*d*) freedom from frost.

In Queensland these conditions are combined in the area of land lying within the tropical coastal wet belt, and as would naturally be expected it is within this belt that the best trees are to be found.

In the early days of North Queensland settlement numbers of litchis were planted, and although many have since been destroyed there still remain odd trees scattered here and there, chiefly on old selections. The

old-time settler recognised and appreciated the value of a home garden and usually made an effort to surround his home with such a selection of fruits that he had fruit of some kind at any period throughout the year. To these old settlers we are indebted for the propagation of many varieties of fruits, probably the best of them being the litchi.

Cultivation and Fertilization.

Regarding the cultivation of the litchi, little is necessary beyond maintaining the soil in good condition and keeping up the supply of moisture. Heavy mulching under the trees is regarded favourably, and since the tree is generally reported as a shallow-rooted one with its feeding roots close to the surface, this practice would be very beneficial under tropical conditions.

No experimental work has yet been carried out with artificial fertilizers on this tree, so any recommendations on the matter could only be based on guess work. In the East night-soil and the carcasses of dead beasts are favoured for manurial purposes. In the absence of definite information regarding artificial fertilizers, applications of fowl or goat manure may be regarded as the best treatment in this country.

Pruning and Propagation.

In North Queensland the general rule has been for trees to bear a heavy crop only once in two or three years with no or very few fruit the following years. The tree is one which fruits on the previous season's growth and it is therefore necessary, to ensure a crop every year, to make sure of new growth each year. The production of a very heavy crop apparently absorbs all the energy of the tree, with the consequent result that no new growth is made, resulting in no crop the following year. To ensure the continuous cropping of the tree the Oriental considers it necessary in picking the fruit to break off the whole spray with a few inches of the branch attached, rather than pull the individual fruit from the bunch. This apparently is analagous to our pruning of a tree, and is quite feasibly the necessary method of pruning the litchi. The general training of the tree should be restricted to the removal of weak inner twigs and the thinning out of crowded branches.

Propagation of the litchi is practically restricted at present, to raising from seed, and gootee. Of these methods the former is unsatisfactory for several reasons, the chief being the inability of the seed to produce true to the parent, the poor viability of the seed from good varieties of fruits, and the extreme slowness of seedling trees in reaching maturity—from eight to twenty-five years. The gootee method of propagation whilst producing trees true to the parent, and cropping usually at about three years of age, does not tend to produce a tree with a particularly strong root system. It is, however, the more satisfactory of the two methods at present employed.

With a serious expansion of litchi cultivation more up-to-date methods of propagation must be resorted to and working on stocks of the sturdier and quicker growing members of the genus would probably be attempted on a commercial scale. Experimental work on the Longan stock (*Euphoria longana*) is reported as having met with some success, but further study of results is necessary before generally recommending this stock.

Varieties and Yield.

Many varieties are recognised and propagated in both China and India. Amongst the best of the Chinese are "Loh Mai Chee" and "Kwai

me,'' whilst the better known of the Indian fruits are probably the ''Bedana'' and ''Mazufferpur.''

The yield varies considerably according to age and condition of the trees. H. Newport has recorded a tree in the Cairns district as bearing 4 cwt. of fruit in a season at the age of about twenty-five years. Two hundred to three hundred pounds is regarded as a fair average for trees about this age.

In North Queensland the crop ripens during late December and January. Should the wet season be an early one some loss is experienced as the ripening fruit are subject to damage by rain.

Pests and Diseases.

The chief pest attacking the fruit is the flying fox, whose depredations may cause heavy loss. Fruit fly has also been reported as attacking the fruit at times, particularly if the crop is late.

Ringbarking of the limbs of the tree has been noted on occasions, the damage apparently being done by the larvæ of some beetle. An occasional inspection of the interior of the trees should be made for these borers. Their presence may be readily detected by the sawdust from their borings, which are usually located near a fork.

PLANTING DECIDUOUS FRUIT TREES.

By H. St. J. PRATT, Instructor in Fruit Culture.

THE planting of deciduous fruit trees should be done in July if possible, and must be completed in August at the latest. The roots of fruit trees are working throughout the winter, although the tops are dormant, and early planting is desirable so that the trees can get established and become fit and strong enough to bear the strain of leaf and shoot production in the spring. If a tree is planted in July or early in August, by the time it should be putting forth its leaves and young shoots there will be an immense number of young rootlets growing from the sides and ends of the original roots, drawing nourishment from the soil to support the growth of leaves and shoots. Should the tree be planted late it will come into leaf before the young roots have developed sufficiently to support growth; the leaves will draw the sap that is in the tree, and when that is exhausted the tree suffers severely. The tree will be living, as it were, from hand to mouth—it has no sap reserves. If the weather conditions are ideal the grower will get away with it and may even say that early planting is unnecessary, but if the weather conditions are not good then a very great strain is put on the tree—it may be stunted, put on a weakly growth, or even die, and then the grower may blame the nurseryman for sending out weak trees and suggest that they were diseased, whereas he alone is to blame for not planting them at the proper time.

Young trees when lifted from the nursery of necessity have their root systems reduced considerably, and so when planted out the tops must be severely shortened to balance not only the reduced rooting system but also the break in its development. The shortening of the tops also has the advantage of retarding leaf growth and so giving the roots additional time to store up sap so as to ensure a regular flow when growth commences.

APPLE PRUNING IN THE STANTHORPE DISTRICT.

By H. St. J. PRATT, Instructor in Fruit Culture.

THE object of pruning is to make the tree bear regular crops each year of good-sized commercial fruit over as long a period of years as is possible. If too much bearing wood is left, the tree will be weakened by setting too heavy a crop for it to stand, and if too much bearing wood is cut out, then rank wood growth with a light crop of over-sized and unsaleable fruit will be the result. To achieve the objective the tree must be kept growing and annual common sense pruning is required, together with good cultivation and maintenance of the fertility of the soil.

If a tree is allowed to go unpruned, it would fruit right up the leaders, turn inside out with the weight of the fruit, fail to put on growth, and bear a fairly large crop biennially, and its commercial life in the Stanthorpe district would be of very short duration. The tree would not die, but it would not pay. It should be borne in mind that fruit is really a sign of weakness; Nature says—"Reproduce, and then die."

A healthy tree must have plenty of foliage, and be kept moving as to leader and lateral growth. The rooting system and the top are so much bound up with one another that, if the top is at a standstill, the roots cease functioning properly, and conversely anything that militates against the roots will adversely affect the top.

More fruit will always be produced on laterals than on spurs on the leaders. Laterals can be kept growing, but not so spurs which multiply and get weaker every year; this makes spur pruning necessary, a very tedious process.

It will be found that, in pruning an apple tree, practically every lateral will require some attention to keep the tree in a really healthy condition. Those of last year's growth will require shortening, and of those carrying spurs, some will require shortening back to a single spur in order to produce fresh growth after the fruit has set, to be shortened the succeeding year to keep the tree growing. If a lateral remains unshortened it bears an apple at the terminal bud, and then spurs back as far as the quantity of sap or vigour of the tree will permit. With a twelve inch lateral, it would probably spur back four spurs, and the remaining eight inches would become barren, and that lateral would be at a standstill; but if, on the other hand, the lateral was reduced to six or four inches, according to its strength, the apple at the terminal would be lost that year, but the next year the top bud would have put on a strong growth, the second bud a weak growth, the third a dart, and the next two or three buds would have developed into spurs, and the fruit would then be close to the leader or sub-leader with growth beyond the fruit.

Sap in a fruit tree always flows to the top or extremities—the top bud gets the most sap, the second bud less than the first, and the third less than the second, and so on; but it will have to be remembered that there is not sufficient sap to develop all the buds, and a good pruner, before cutting a leader or a lateral, unconsciously makes a quick mental calculation as to how many buds can be left so that practically every bud will develop. The length that can be left will

depend on the vigour of the tree. Whenever a lateral or leader is cut it acts like a suction pump, drawing the sap, and so assists very materially in keeping the sap in circulation.

The aim of the pruner should be to get growth and foliage beyond the fruit. The leaders of the tree must be well defined, and nothing should interfere with their growth or enter into competition with them. It is better to make the tree proceed upward and slightly outward slowly with sturdy limbs well furnished with laterals, than to run the tree up quickly by long pruning with barren spaces devoid of fruiting wood. Everything connected with a fruit tree, whether lateral or leader, will grow more vigorously vertically than horizontally. In the shaping of a tree be careful not to develop too great a spread during the first few years prior to the tree's coming into bearing. The weight of the fruit will bring out the leaders considerably, and many a grower who has been proud of his goblet-shaped trees when four or five years old has been horrified to find them requiring props to prevent them turning inside out as soon as they bore a crop of fruit.

PRODUCTION OF EARLY-BEARING GRAPE VINES.

Following is a translation of an extract from "Der Landfreund" (Berne, Switzerland), 10th May, 1935:—

NORMALLY several years are required before a grape vine produces its first fruit. We give below a procedure by which vines can be raised that will have produced beautiful clusters by the first year after planting.

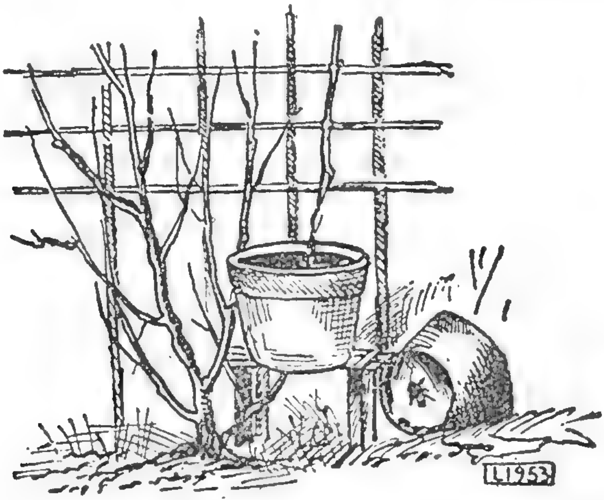

PLATE 53.—A sound, healthy shoot of the vine is introduced into the pot, as shown in the illustration.

Early in the year, before the sap begins to mount, select a suitable slender vine without side shoots. Stick it through a hole bored in the bottom of an old pot or such like, and fix the vessel on a stand so that the vine is subject to no shocks and can be trained over the trellis in the usual way. Fill up the pot with compost or good calcareous garden

soil, and keep the vine quite moist by regular watering. The vine then strikes root abundantly inside the pot in the course of the summer and autumn. In the winter make sure of a frost proof covering.

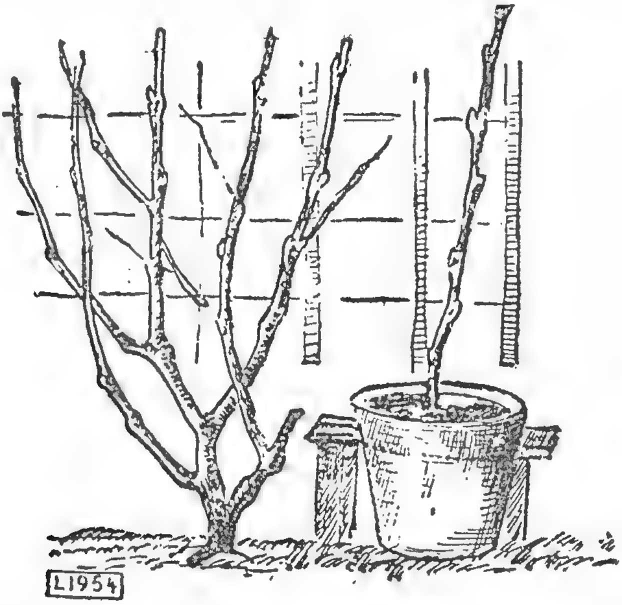

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PLATE 54.—After striking root, a fairly rapid process, the vine is cut off, and thereby another plant is obtained.

At next spring the vine can be cut off at the pot, and the now rooted and vigorous plant can be transferred to the place already selected (and well-prepared) for it. The vine will bloom at the accustomed time and produce fruit.

CITRUS BUDWOOD SELECTION.

THE large proportion of trees of undesirable strains in many of our citrus orchards is largely due to the lack of care in the selection of budwood.

With regard to citrus trees, there is no general accepted theory to account for bud variation; it is of a more or less frequent occurrence in trees of all varieties. It may manifest itself in the habit of growth of the tree, or in the size, colour, texture, abundance or scarcity of the fruit. Sometimes a tree grown from a single bud will develop several distinct strains of fruit. Minor variations in fruit characteristics are of very frequent occurrence.

It must be patent to growers that too much care cannot be taken in the selection of budwood. Nursery propagation of bud variation may be largely avoided through the use of buds selected from trees whose records have shown them to be heavy, consistent producers of fruit of a desirable strain.

In this regard Queensland has enacted legislation prohibiting the sale of citrus trees excepting those which come up to certain desirable standards. Nurserymen now sell only the acknowledged best varieties of trees which have been grown from seed selected under the supervision of an officer of the Fruit Branch of the Department of Agriculture and

Stock, and which have been worked with scions selected under the supervision of such officer from vigorous trees free from disease and bearing large, consistent crops of fruit characteristic in all respects of the variety.

In connection with this budwood selection, a plot of trees, worked from specially selected buds, has been planted for the purpose of future budwood supplies. To bridge over the period until supplies become available, buds are secured under Departmental supervision from Queensland's finest citrus trees, of known performance, producing fruits of a desirable strain characteristic of the variety.

The following nuserymen supply trees grown from specially selected seed and worked with budwood selected under supervision, and are recommended to growers:—F. E. Benham, Byrnestown; T. Houghton, Lawnton; O. Houghton, Lawnton; C. Langbecker, Bundaberg; E. Obrist, Rochedale; E. A. Obrist, Bundaberg; J. Obrist, Rochedale; E. Sandall, Sunnybank; J. Trim, Mount Gravatt; E. Taylor, Eight-mile Plains; and H. Williams, Runcorn.

MARKETING NOTES.

By J. H. GREGORY, Instructor in Fruit Packing.

Deciduous Fruits.

DECIDUOUS growers should now give attention to cleaning up the boxes used for picking and the machinery used for sizing and handling, in an endeavour to eliminate Brown Rot and kindred diseases which might easily be carried over to next season's crop if precautions are not taken. Spraying the machinery, &c., with a solution of 1 part of formalin to 20 parts of water, and dipping the boxes for two minutes in lime sulphur solution, will be effective and go far in helping to check these troubles next season.

Apples.

A very difficult season has now drawn to a close. The apple crop, owing to severe hail damage in most parts of the Granite Belt, was hard to handle satisfactorily. Growers should not attempt to cold store for late marketing apples that have been affected by hail, as apart from the risk of the fruit becoming "specky" in store, it will be hard to obtain prices that will cover the extra expense of cold storage, as this fruit will be sold in competition with Southern fruit unaffected by hail.

The results of this season's marketing must give us food for a great deal of thought. At present one of our most largely grown apples is under a cloud—I refer to the Dunns. This apple is the finest early cooker, and possibly the finest cooker we grow, yet immediately green Granny Smith apples are placed upon the market, the prices of Dunns fall to an unprofitable level. If as much propaganda were used in boosting the Dunns as is with the Granny Smith, and housewives were made acquainted with its excellence, then our Cinderella of apples would possibly return prices which would be of great advantage to the apple districts. The writer would mention in passing that to date Dunns

when in season are being used in preference to Granny Smiths by many of those housewives whose families produce both Dunns and Granny Smith apples.

Now let us look at the results of our Granny Smith marketing. In the Granny Smith as grown in Queensland we produce, I consider, the finest apple of its type in Australia. In our marketing of this apple are we doing the correct thing in order to maintain the excellent reputation that past years have given it? This season Granny Smiths were placed on the market early in January, the prices for the first consignments touching 12s., whilst Jonathans, which are considered inferior to the former, were realising much lower prices. A fortnight later, due to their immaturity, Granny Smiths were down to 6s., with Jonathans up to 2s. per case higher. A month later, when the Granny Smiths were more forward, the prices had risen 1s. to 2s. per case, and this in face of the extra opposition offered by the large quantities of badly hail-marked fruit and export culls which were placed on the market. The prices of Jonathans remained about the same. On examining the whole marketing situation I consider it only reasonable to expect that better financial results would accrue to the industry if the opposition offered to the Dunns by green Granny Smiths early in the season was removed, and a good boost was given to the Dunns through intensive advertising. It is only late in the season that the Granny Smith matures to be the great apple we can all appreciate.

Exporters have become acquainted with the new grade designations "Extra Fancy" and "Fancy." I would point out, however, that the old designations "Special," "Standard," and "Plain" still apply to the local marketing of apples.

Publications in connection with apples issued by the Department and now obtainable free upon application are packing charts for packing both the standard and dump cases, and a leaflet on cold-storing Granny Smiths. A comprehensive booklet on marketing apples will be issued in the course of a few weeks, embracing harvesting, packing, and storing information.

Citrus Fruits.

The citrus season is with us, and growers must for their own protection become acquainted with the requirements of the citrus maturity standards. These are as follows:—

In the case of oranges, grape fruit, and mandarins, the weight of the hand-pressed juice in mature fruit must be not less than 30 per cent. of the total weight of the fruit.

As regards navel oranges and mandarins, ten cubic centimetres of juice must be neutralised by not more than twenty-six cubic centimetres of deci-normal (N/10) alkali, while in the case of oranges other than Navels ten cubic centimetres of juice must be neutralised by not more than thirty cubic centimetres of deci-normal (N/10) alkali.

An outfit for testing, complete with solutions, instructions, &c., can be obtained from the Committee of Direction of Fruit Marketing.

These maturity standards are being enforced, and some early-marketed lines of fruit were removed from the market. Growers using artificial colouring methods should use only ethylene or acetylene gas

methods. Motorcar exhaust gases or kerosene lamps will only create difficulties in marketing. It must be remembered that only matured fruit will colour satisfactorily. The practice of colouring should not be condemned, but rather the abuse of it by growers who have not the interests of the industry at heart.

The usual warnings are given with regard to blue mould. The use of picking bags is not recommended, as they roll the fruit, causing small skin damage to occur with consequently a much greater chance of mould infection.

In packing, the count system is recommended in preference to sizes. First grade fruit should always be wrapped. Eliminate as far as possible small sizes of fruit, as there is no demand for them. Send regular consignments, as haphazard marketing does not give your agent a chance to work up a connection.

Publications available for free distribution include packing charts for oranges in both the standard and dump cases, and booklets on marketing both oranges and lemons. A packing chart for lemons is in course of preparation and will be available at an early date.

Tomatoes.

Growers marketing coloured lines continue to obtain better prices than those marketing green or partly-coloured lines. Local growers of small lines of tomatoes using second-hand cases must take care to scrape off or obliterate all marks placed on the cases by previous users.

Publications available include a packing chart and a booklet on marketing tomatoes in the dump half-bushel and long half-bushel cases.

Custard Apples.

Many growers still do not attempt to make good packs of this fruit. The main fault encountered is the large amount of green fruit placed on the market. Such practice very quickly turns away consumers from this luscious fruit, as green custards go black in the skin and are lacking in flavour.

Papaws.

Many green papaws also are on the market. Winter papaws are hard to ripen off the tree, so fruit should be allowed to advance to a more coloured stage before picking in winter than in summer.

Pineapples.

Care should be taken to eliminate as far as possible pineapples with brown heart. Since the cold weather this trouble is more apparent, especially in Roughs, making customers doubtful when buying.

Publications are available from the Department on the packing of passion fruit, pineapples, custard apples, papaws, and strawberries.

Plate 55.—Noosa Heads, South Queensland.

Plate 56.—A Favourite Corner on a North Coastal Dairy Farm.

Lemon Growing in Queensland.

By R. L. PREST, Instructor in Fruit Culture.*

LEMON production in Queensland has shown a slight but satisfactory increase, and the quality of the fruit is equal, if not superior, to the Italian and Californian fruits. The newer orchards have been, and are now being, planted on sound commercial lines. The trees are all worked on selected stocks with scions from known-performance trees, so that where the maximum attention is given and the trees grown under suitable soil and climatic conditions, the production of desirable fruits is as far as possible ensured.

With one or two exceptions the choicest lemons are produced in some of our semi-arid regions where suitable soils and water for irrigation purposes are available. Lemons will succeed well on a good many kinds of soils providing they are deep and well drained.

In relation to fruit quality, soil relations are difficult to discuss, as they are closely bound up with other contributing factors. Evidence in Queensland points to sandy loams (where the environment is suitable and reasonable measures can be taken to offset adverse seasonal conditions) as being the most satisfactory for the production of high grade lemons. Suitability appears to be due more to the physical properties of the soil and the maintenance of such physical condition than to the chemical properties. It is therefore important that from the outset attention be given to keeping up the humus content in the soil. In the absence of farmyard manure, which would be required at the rate of at least 20 tons to the acre, green manuring must be resorted to, care being taken to see that such crops do not compete with the trees for moisture. General observations from field trials would indicate that nitrogen is one of the main constituents required to maintain healthy and vigorous lemon trees. At the same time phosphoric acid and potash have their place. At least 6 cwt. of sulphate of ammonia to the acre, with 4 cwt. of phosphoric acid and 2 to 3 cwt. of potash would be a basis for a fertilizing programme for mature bearing trees. The nitrogen is best supplied so as to be available during the spring. Such practice tends to increase the crop and improve the quality. Whether or not an autumn application will be necessary will depend upon the vigour of the tree. The promotion of too much vigorous growth at this period is detrimental to the production of high grade fruit. However, it will be found that a light dressing of nitrogen with rather increased quantities of phosphoric acid and potash will assist in maturing autumn growth and future fruiting wood, and will also benefit the crop.

Irrigation.

In Queensland this practice is as yet in its infancy. It is felt, however, that far better results will be achieved by the checking of soil moisture by means of a soil augur, and so learning the moisture requirements to a far greater depth, than by the usual examination of only the top 3 or 4 inches. Many of the lemon-growing soils are of a deep sandy nature and more likely to be over-drained than under-drained. More frequent and regular waterings would greatly tend to reduce the wilting that frequently occurs.

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* From a radio broadcast from National Station 4QG, Brisbane, and 4RK, Rockhampton.

Pruning.

The general practice has been to prune lemon trees quite severely while they are young in an effort to control the growth for a strong framework. Apart from the treatment at planting, which consists in the shortening back and removal of badly broken and bruised roots, together with a corresponding shortening back of the head of the tree in such a manner as to ensure a strong straight stem with three or four well-placed main arms radiating from it. During the first two or three years little pruning should be done, comprised merely of a thinning system, with practically no heading back except perhaps to shorten into laterals. In starting the tree in this system some six main upright shoots, well-spaced, are selected as main leaders. As they become weighted down at the ends, strong side-shoots will arise, and these may be thinned and shortened to make fruiting spurs, suitable ones being left to take the places of former leaders. Practically no lower branches are cut, even though they may appear crowded. It is seldom that a crowded condition on a young lemon tree warrants the removal of foliage.

As the tree grows older it is built up in a series of irregular tiers of branches radiating from central permanent parts. The object sought after in building up the tree by means of a series of branches bending from an upright position is to establish a fruit-bearing habit. The quiet habit assumed by the side shoots arising from such branches is conductive to fruit production. The vigour of the vertical shoot does not allow it to throw into fruit until subdivisions become numerous and weak.

When shortening any side shoots the cut should be made back into ripe wood, tending to throw the sap into dormant buds. Any light wood issuing from inside the more erect permanent arms may be retained and from time to time renewed, but no rank growth is tolerated unless it is required to continue the work of some displaced leader. As the lower limbs drag down it will be found necessary to lift the tree from time to time by removing some of these lower limbs.

Picking and Curing.

Lemons carefully handled and gathered at the right stage of maturity may be successfully cured and stored on the orchard for several months without deteriorating, but rather with improvement to their appearance and carrying qualities. All fruits should be clipped, not pulled from the trees, just as they are turning colour. The fruit should be of normal size and the dark green colour just turning to a paler shade which is generally termed silvering. In order to avoid injuring and bruising, and thereby leaving the fruit open to the attack of moulds, it is important to remember that it must at all times be handled with the very greatest of care. After picking, the fruit should be placed in shallow trays and allowed to remain for several days to sweat off excess moisture. When storing for any length of time, dipping in a bluestone solution 1 in 500 for a period of one to two minutes is recommended. After thoroughly drying, the fruit is packed in bushel cases and stacked in a storing chamber in such a manner as to permit a ready circulation of air. Such chamber should be so constructed as to lend itself to control of the relative humidity. A low relative humidity results in the shrinkage of the lemons, with a consequent loss of weight and an inferior colour in the fruit, accompanied by a shrivelling as well as the browning and dropping of the buttons of lemons held in storage for any period. These conditions are mostly apparent during late spring, a period of

relatively high day-time temperatures and a low relative humidity. Satisfactory conditions may be obtained by controlling the humidity at from 85 to 90 per cent. For controlling the humidity a humidifier may be cheaply constructed by hanging a series of absorbent cloths from a frame, above which a small perforated iron water pipe permitting water to drip when required is fixed, and the air in the chamber circulated by means of a small fan. Under such conditions lemons may be stored for several months.

Other methods used in storing lemons are, after sweating, to loosely pack the fruit, either wrapped or unwrapped, in cases lined with paper, which are stacked in a cool dry shed in blocks of from fifty to sixty cases and covered with a canvas sheet or tent. Low open water containers may be introduced when necessary, always as far as possible avoiding extreme variations in temperature and humidity. Fruits should be examined at intervals of ten days, and those showing signs of decay removed. Or they may be stored by wrapping the fruit in sulphite tissue wraps and loosely packing in cases lined with paper, using chaff or straw as a filler. The bottom of the case is covered with a layer of straw or chaff, a layer of lemons is then placed thereon, and the spaces filled and the lemons covered with a further layer of chaff or straw, and so on until the case is full. The cases are then stacked, handled and examined as for the cases packed without chaff.

PLATE 57.—LAKE COOTHARABA, SOUTH QUEENSLAND. BOREEN POINT IN THE MID-DISTANCE.

A Handy Lidding-Press for Cased Bananas.

THIS press is easy to make and simple to use. The following timber is needed:—

2 pieces 4 inches by 2 inches by 30 inches long for side pieces;

1 piece 3 inches by 3 inches by 13½ inches long for base block;

1 piece 8 inches by 1½ inches by 13½ inches long for pressure unit;

1 piece broom handle 12 inches long for handle of pressure unit;

4 pivots (pieces of broom handle) for pressure unit and base block;

4 pegs or pins to place on the outside of side pieces.

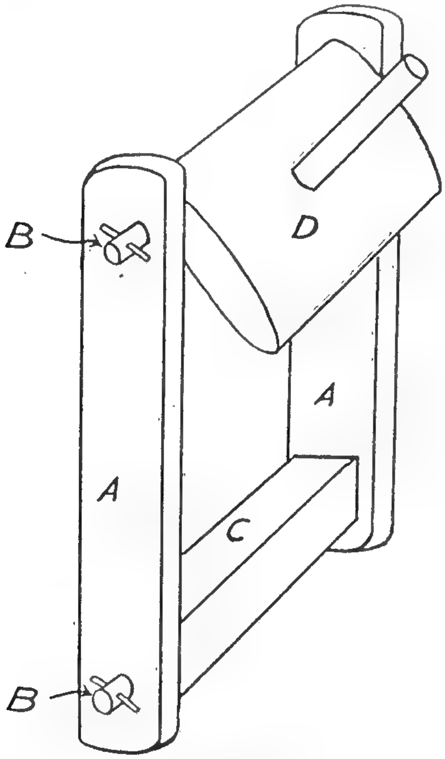


Plate 58.

The side pieces (A) are drilled to take the broom handle pivots (B), which are placed in the ends of the base block (C) and pressure unit (D). The holes should be drilled so as to permit the bottom of the pressure unit and the top of the base block to be 12½ inches apart (see Plate 58).

The pressure unit is made by taking the 8 inch by 1½ inch by 13½ inch piece of timber and rounding one edge. This is the bottom edge which comes in contact with the box lid while pressing. The board is

drilled at the opposite edge to take the pivots, one being inserted at either end about 1½ inches from the top edge. The lever is inserted in the middle of the board 3½ inches from the top edge.

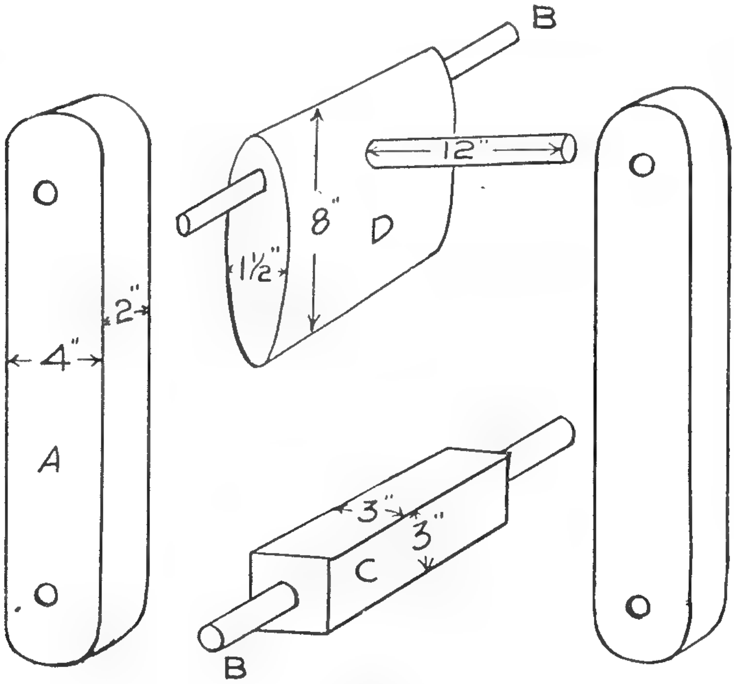


PLATE 59.

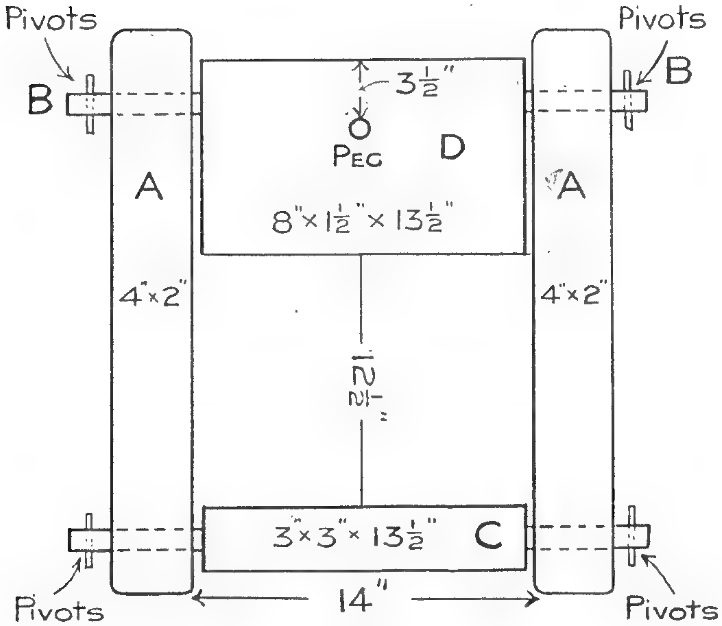


PLATE 60.

The base block of 3 inches by 3 inches timber is made by inserting two pivots into the ends. The pivots should be approximately 6 inches long, and be inserted at least 2 inches into the pressure unit and base block.

A glance at Plates 59 and 60 will illustrate the method of use.

Thanks are due to Mr. E. H. Taylor, of Upper Mudgeeraba, for his assistance in making available the means for photographing the appliance.

Plate 61.—Before Applying Pressure to Lid.

Plate 62.— Pressure Applied.

Apple Packing for Export and Home Markets.

By JAS. H. GREGORY, Instructor in Fruit Packing.

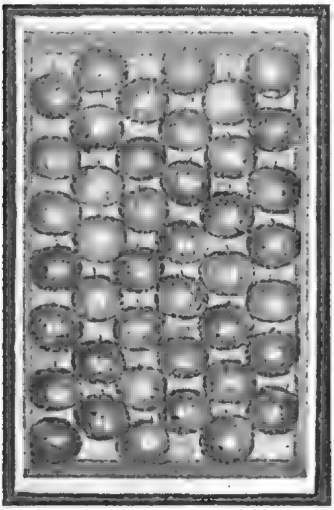
PART II.

(*Continued from p. 70, vol. xliii., Part I.—January, 1935.*)

HOW TO PACK THE STANDARD CASE.

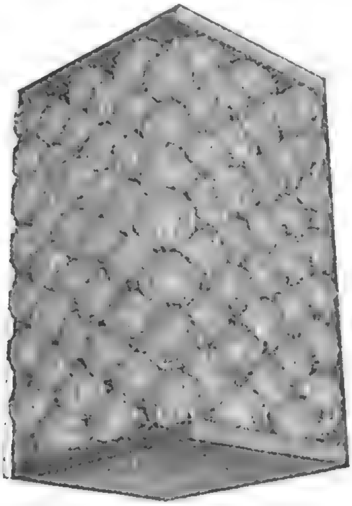
3-3 Pack.

First Layers.



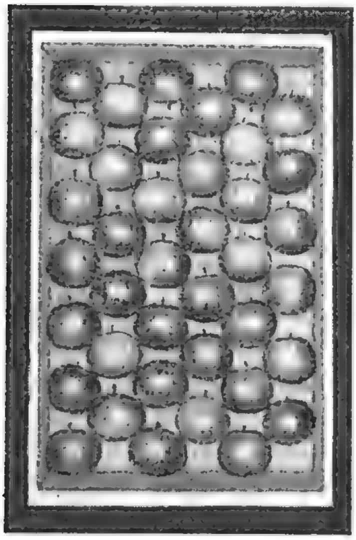
3-3 Pack, 7 x 7 Layer Count.
6 Layers. 252 Count.

Finished Case.
Top Side



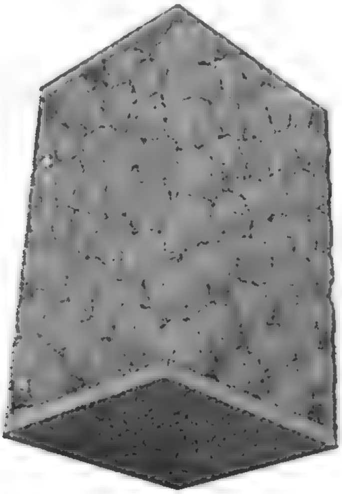
3-3 Pack. 252 Count.

First Layers.



3-3 Pack, 7 x 6 Layer Count.
6 Layers. 234 Count.

Finished Case.
Side Top



3-3 Pack. 234 Count.

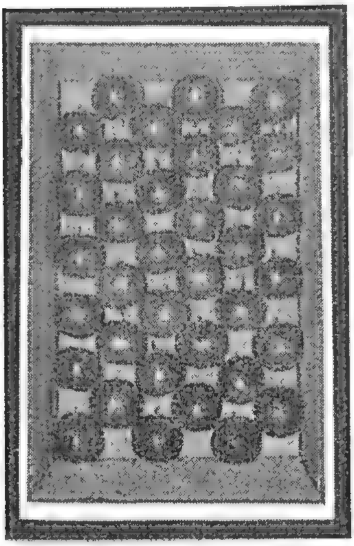
Observe the alignment of the fruit across, up and down, and diagonally in the case.

PLATE 63.

How to Pack the Standard Case.

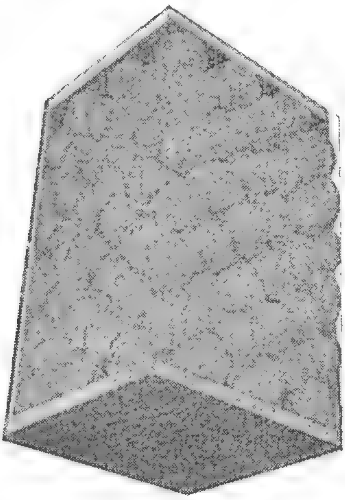
3-3 Pack.

First Layers.



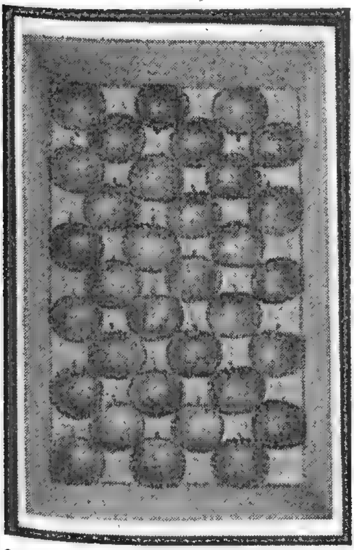
3-3 Pack, 6 x 6 Layer Count.
6 Layers. 216 Count.

Finished Case.
Side Top



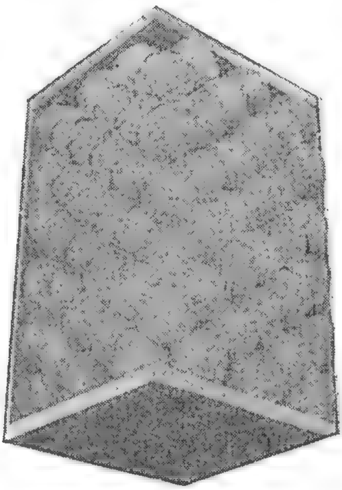
3-3 Pack. 216 Count.

First Layers.



3-3 Pack, 6 x 5 Layer Count.
6 Layers. 198 Count.

Finished Case.
Side Top



3-3 Pack. 198 Count.

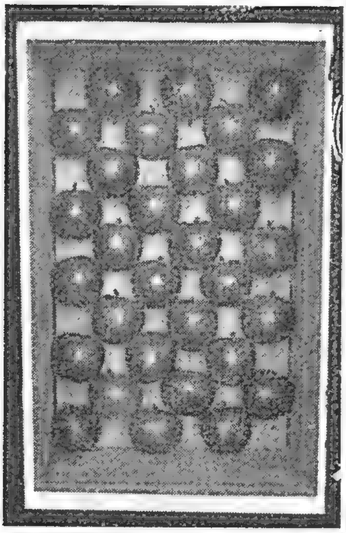
Observe the alignment of the fruit across, up and down, and diagonally in the case.

Plate 64.

How to Pack the Standard Case.

3-3 Pack.

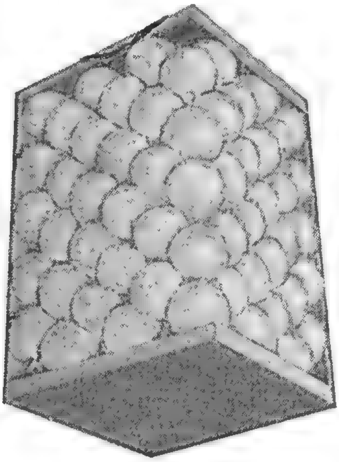
First Layer.



3-3 Pack, 5 x 5 Layer Count.
6 Layers. 180 Count.

Finished Case.

Top Side



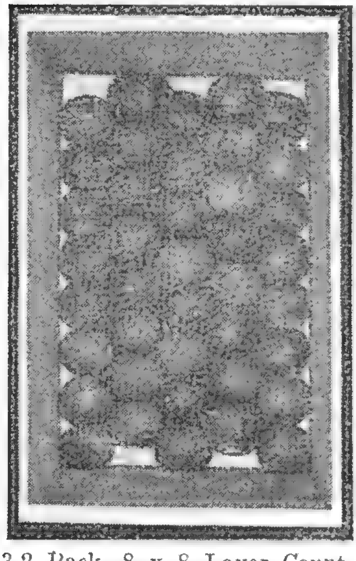
3-3 Pack. 180 Count.

Observe the alignment of the fruit across, up and down, and diagonally in the case.

How to Pack the Standard Case.

3-2 Pack.

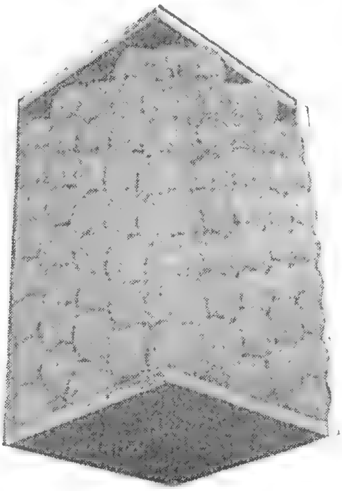
First Layers.



3-2 Pack, 8 x 8 Layer Count.
5 Layers. 200 Count.

Finished Case.

Top Side

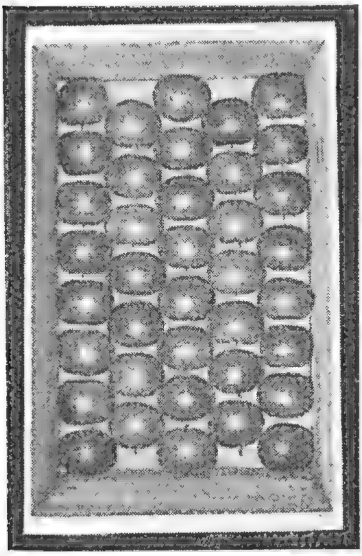


3-2 Pack. 200 Count.

PLATE 65.

How to Pack the Standard Case.

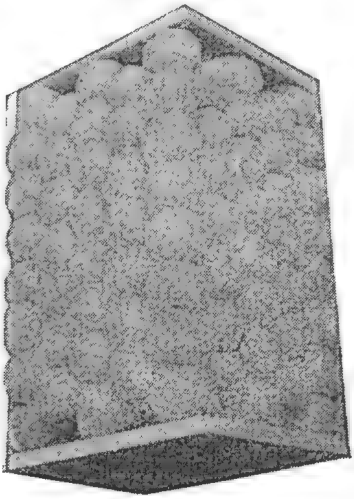
3-2 Pack.



3-2 Pack, 8 x 7 Layer Count.
5 Layers. 188 Count.

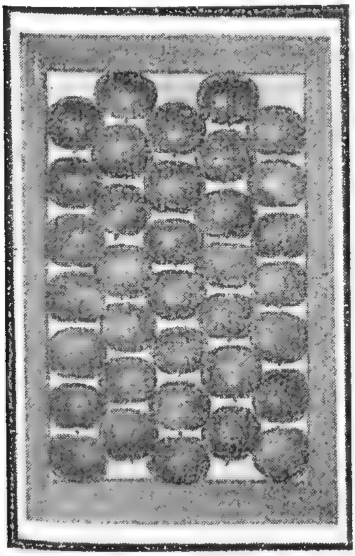
Finished Case.

Top Side



3-2 Pack. 188 Count.

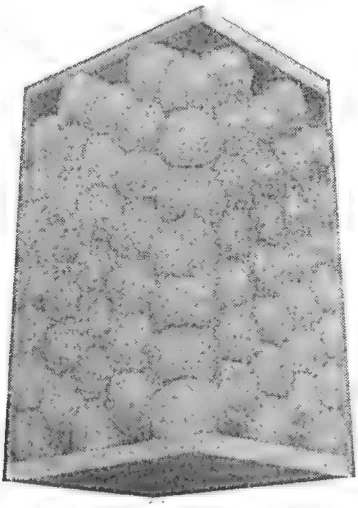
First Layers.



3-2 Pack, 7 x 7 Layer Count.
5 Layers. 175 Count.

Finished Case.

Top Side



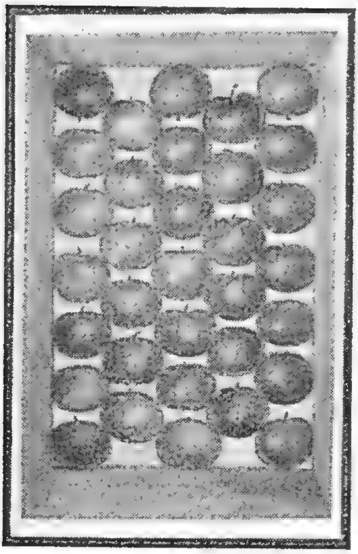
3-2 Pack. 175 Count.

Plate 66.

HOW TO PACK THE STANDARD CASE.

3-2 Pack.

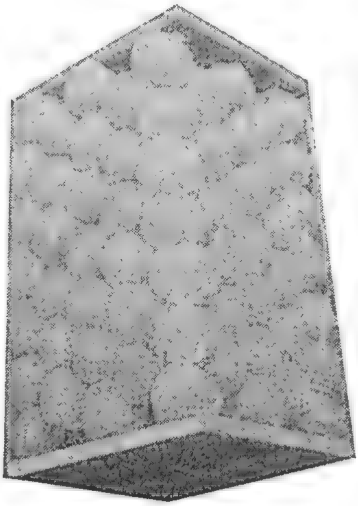
First Layers.



3-2 Pack, 7 x 6 Layer Count.
5 Layers. 163 Count.

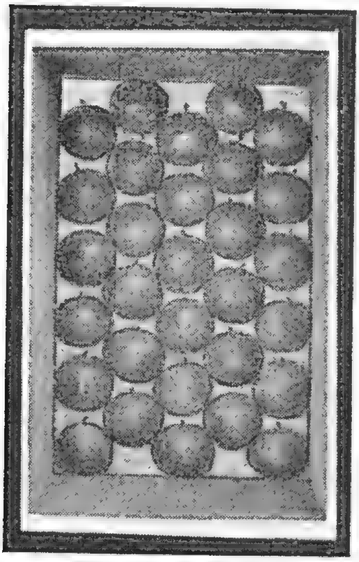
Finished Case.

Top Side



3-2 Pack. 163 Count.

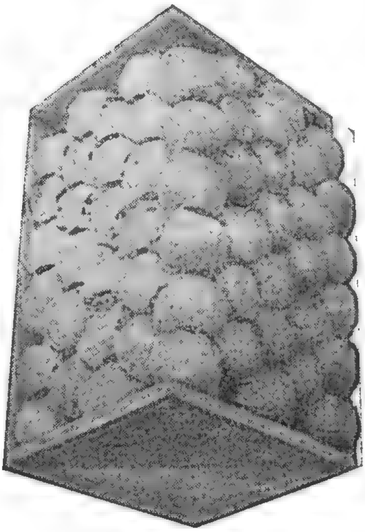
First Layer, 3-2 Pack.



3-2 Pack, 6 x 6 Layer Count.
5 Layers. 150 Count.

Finished Case.

Side Top



3-2 Pack. 150 Count.

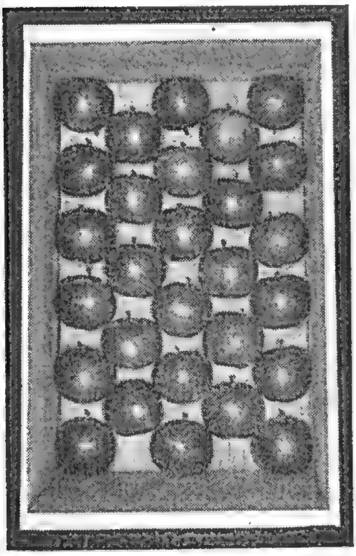
Observe the alignment of the fruit across, up and down, and diagonally in the case.

PLATE 67.

HOW TO PACK THE STANDARD CASE.

3-2 Pack.

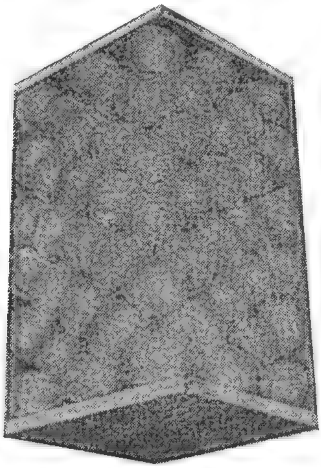
First Layers.



3-2 Pack, 6 x 5 Layer Count.
5 Layers. 138 Count.

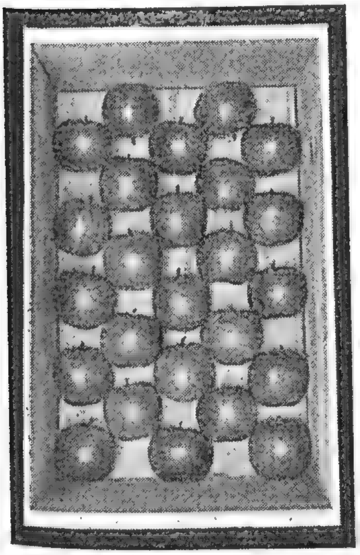
Finished Case.

Top Side



3-2 Pack. 138 Count.

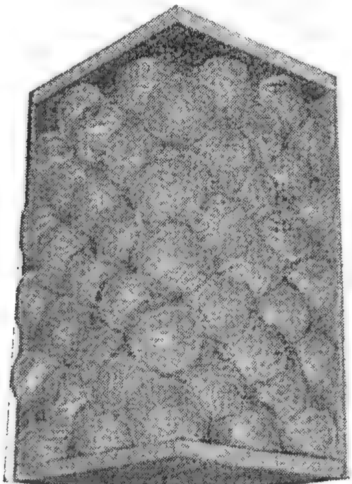
First Layers.



3-2 Pack, 5 x 5 Layer Count.
5 Layers. 125 Count.

Finished Case.

Top Side



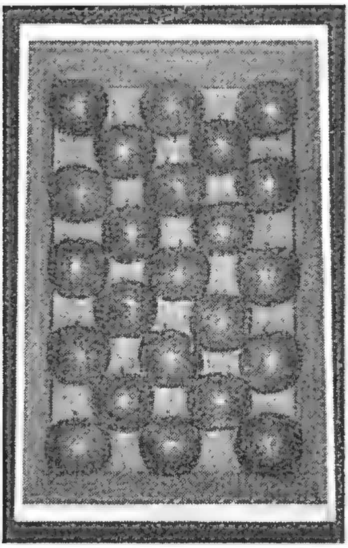
3-2 Pack. 125 Count.

PLATE 68.

HOW TO PACK THE STANDARD CASE.

3-2 Pack.

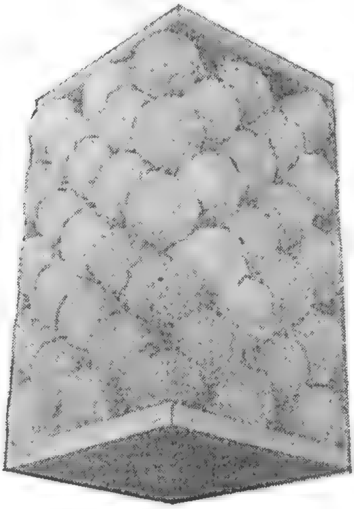
First Layers.



3-2 Pack, 5 x 4 Layer Count.
5 Layers. 113 Count.

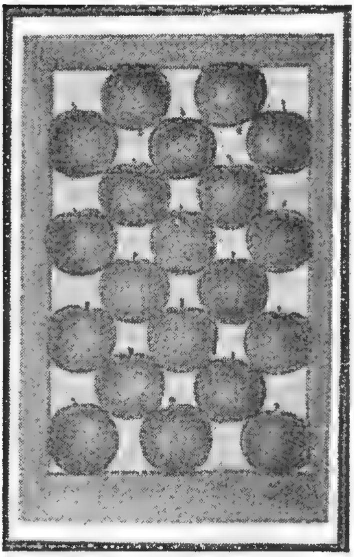
Finished Case.

Top Side



3-2 Pack. 113 Count.

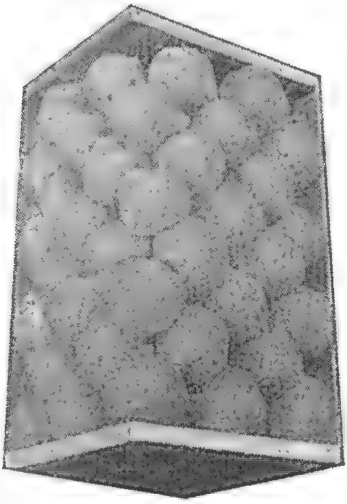
First Layers.



3-2 Pack, 4 x 4 Layer Count.
5 Layers. 100 Count.

Finished Case.

Side Top



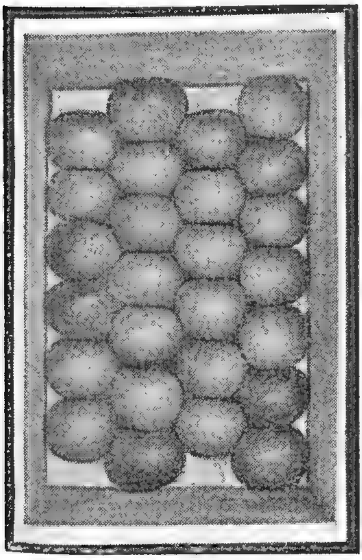
3-2 Pack. 100 Count.

PLATE 69.

HOW TO PACK THE STANDARD CASE.

2-2 Pack.

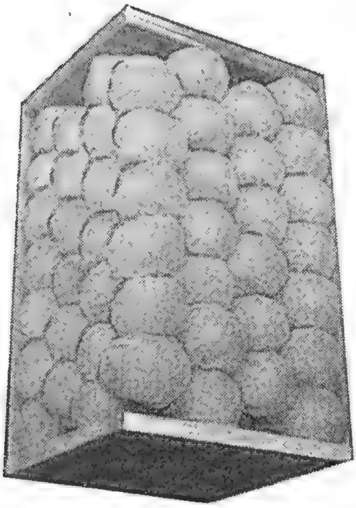
First Layers.



2-2 Pack, 7 x 6 Layer Count,
4 Layers. 104 Count.

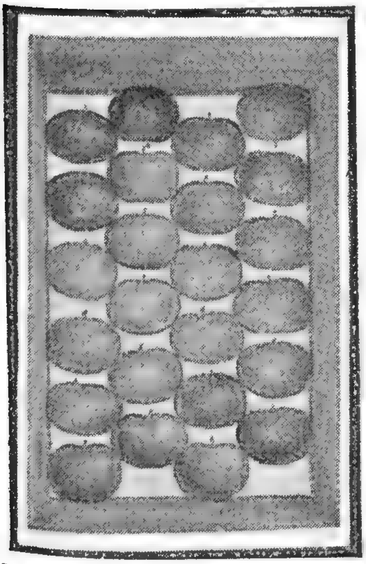
Finished Case.

Side Top



2-2 Pack. 104 Count.

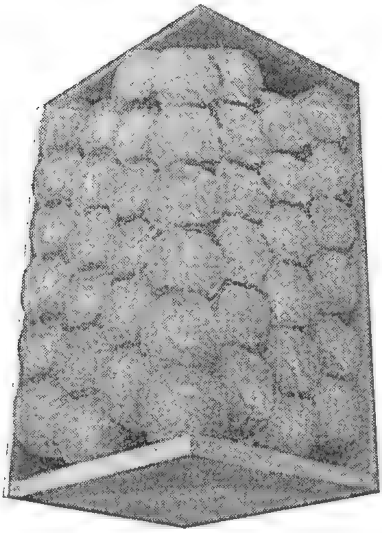
First Layers.



2-2 Pack, 6 x 6 Layer Count.
4 Layers. 96 Count.

Finished Case.

Top Side



2-2 Pack. 96 Count.

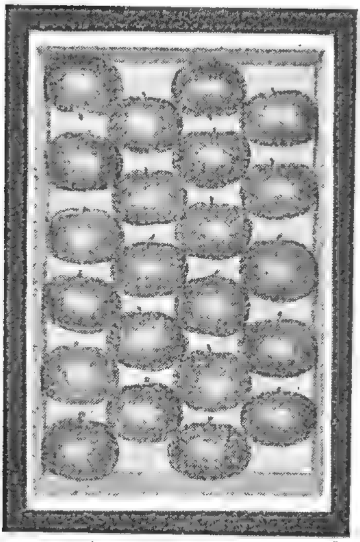
Observe the alignment of the fruit across, up and down, and diagonally in the case.

PLATE 70.

How to Pack the Standard Case.

2-2 Pack.

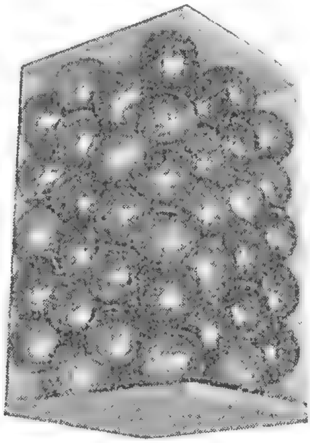
First Layers.



2-2 Pack, 6 x 5 Layer Count.
4 Layers. 88 Count.

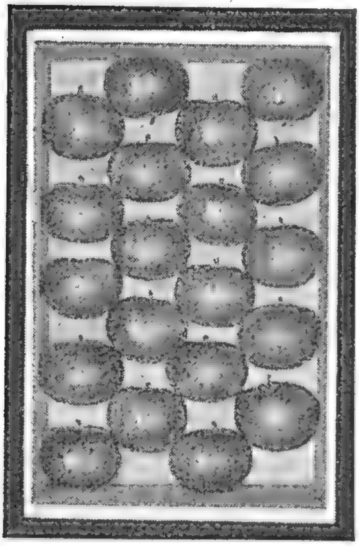
Finished Case.

Top Side



2-2 Pack. 88 Count.
Showing fruit with wrappers removed.

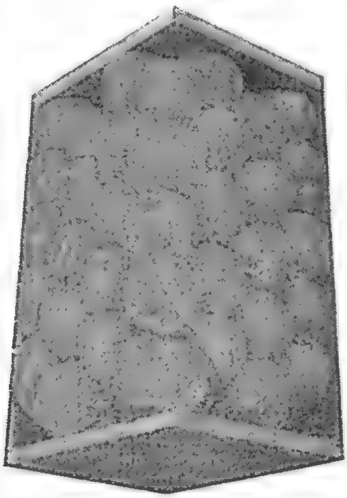
First Layers.



2-2 Pack, 5 x 5 Layer Count.
4 Layers. 80 Count.

Finished Case.

Top Side



2-2 Pack. 80 Count.

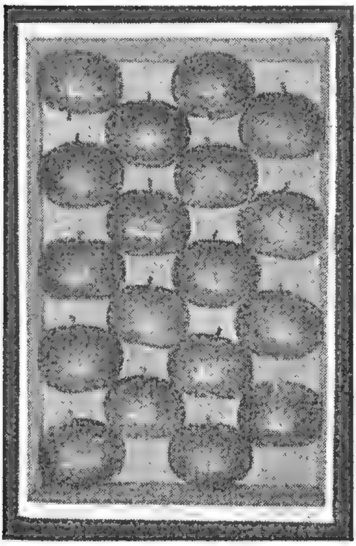
Note alignment of packed cases, across, up and down, and diagonally.

Plate 71.

HOW TO PACK THE STANDARD CASE.

2-2 Pack.

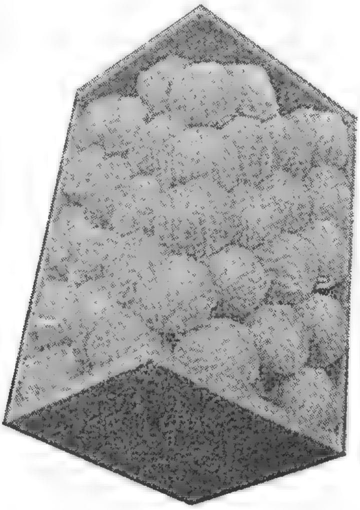
First Layers.



2-2 Pack, 5 x 4 Layer Count.
4 Layers. 72 Count.

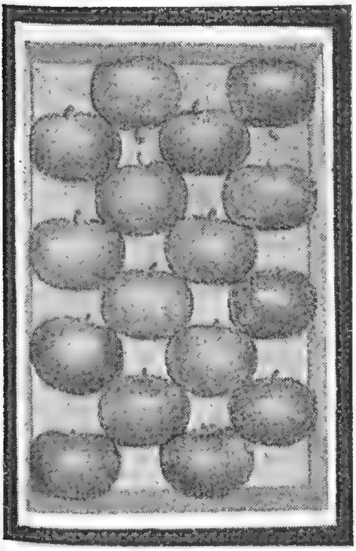
Finished Case.

Side Top



2-2 Pack. 72 Count.
Note alignment of packed cases.

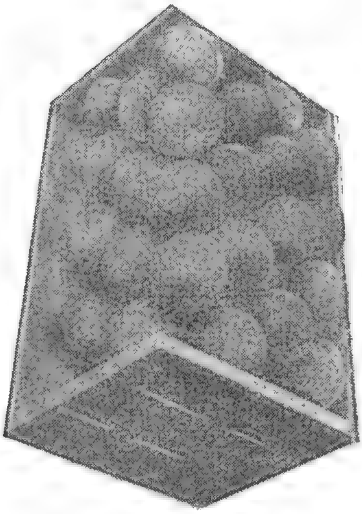
First Layers.



2-2 Pack, 4 x 4 Layer Count.
4 Layers. 64 Count.

Finished Case.

Side Top



2-2 Pack. 64 Count.
Showing fruit with wrappers removed.
Note placing of fruit.

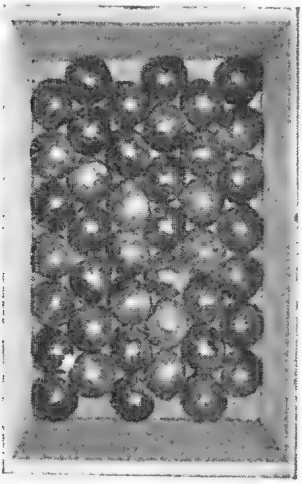
PLATE 72.

EXAMPLES OF ANGLE PACKING IN THE STANDARD CASE.

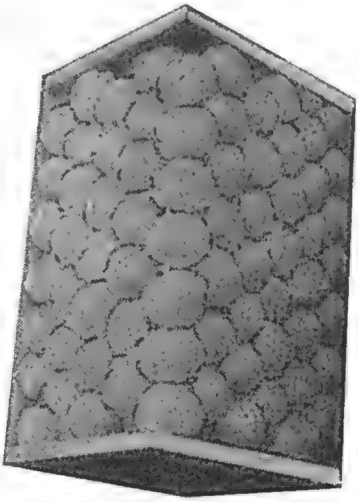
Angle Pack Counts are shown in the table of alternate packs.

3-3 Pack.

First Layer.



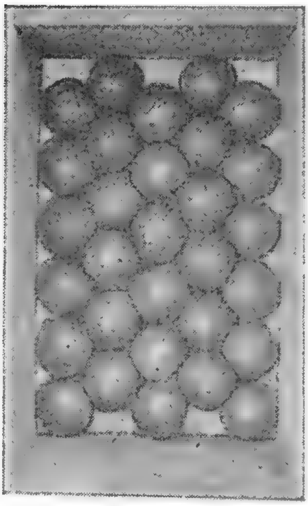
Finished Case.



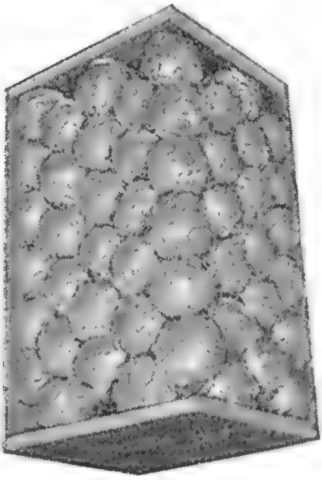
3-3 Pack; 7 x 7 Layer Count. 5 Layers. 210 Count.
3-3 Straight Packs have 6 Layers, compare with this 5 Layer Angle Pack.

3-2 Pack.

First Layer.



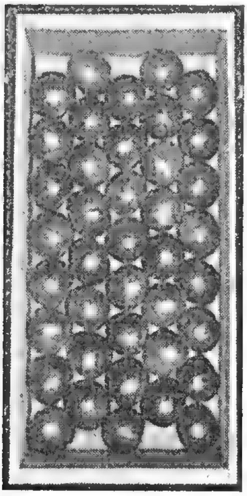
Finished Case.



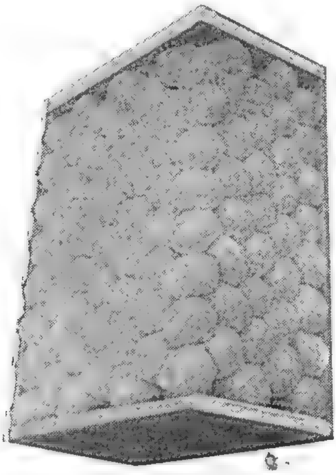
3-2 Pack, 6 x 6 Layer Count. 4 Layers. 120 Count.
3-2 Straight Pack have 5 Layers, compare with this 4 Layer Angle Pack.

PLATE 73.

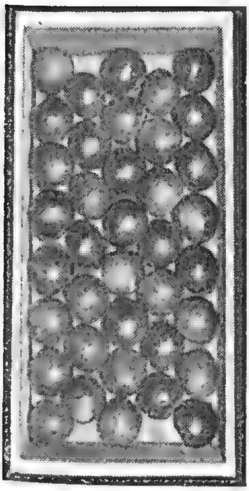
3-2 Pack. All 3-2 Packs have 7 Layers.



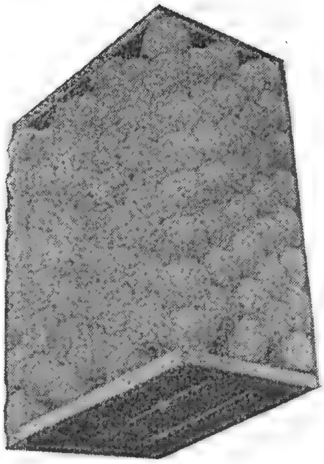
3-2 Pack, 8 x 8 Layer Count. 280 Flat Apples only.



Finished Case.
280 Count. 3-2 Pack, 8 x 8 Layer Count. 7 Layers. Flat Apples only.



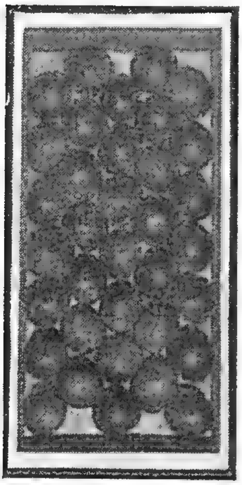
3-2 Pack, 8 x 7 Layer Count. 263 Apples.



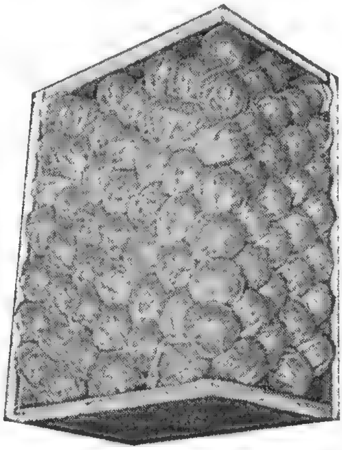
Finished Case.
263 Count. 3-2 Pack, 8 x 7 Layer Count. 7 Layers.

Plate 74.

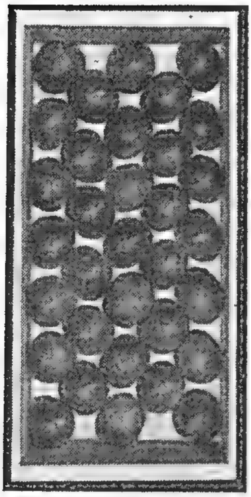
3·2 Pack. All 3·2 Packs have 7 Layers.



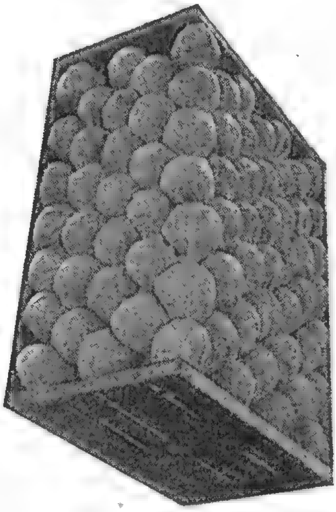
3·2 Pack, 7 x 7 Layer Count.
245 Apples.



Finished Case.
245 Count. 3·2 Pack, 7 x 7 Layer Count. 7 Layers.



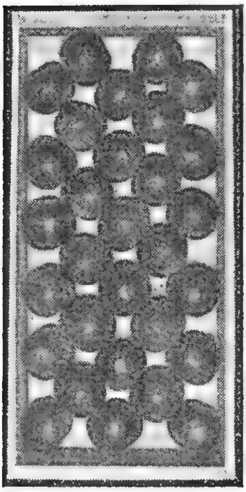
3·2 Pack, 7 x 6 Layer Count.
228 Apples.



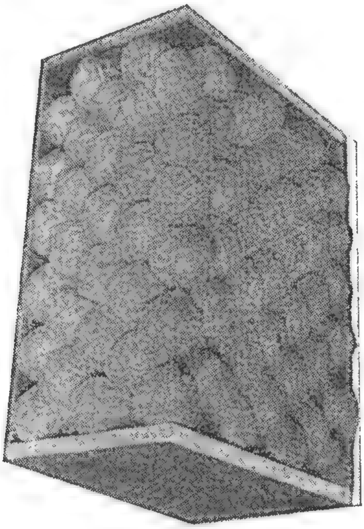
Finished Case.
228 Count. 3·2 Pack, 7 x 6 Layer Count. 7 Layers.

Plate 75.

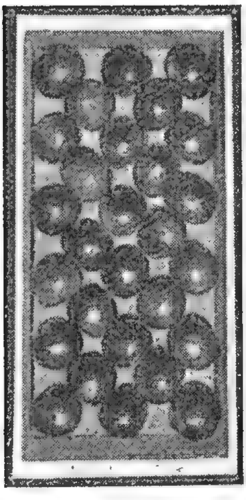
3-2 Pack. All 3-2 Packs have 7 Layers.



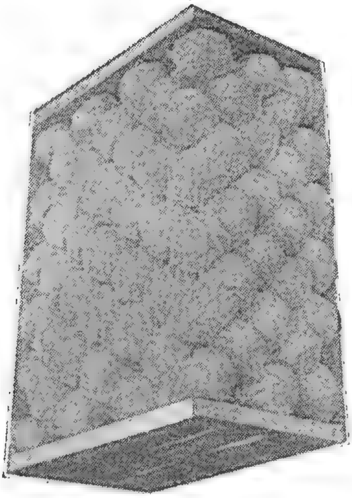
3-2 Pack, 6 x 6 Layer Count.
210 Apples.



Finished Case.
210 Count. 3-2 Pack, 6 x 6 Layer Count. 7 Layers.



3-2 Pack, 6 x 5 Layer Count.
193 Apples.

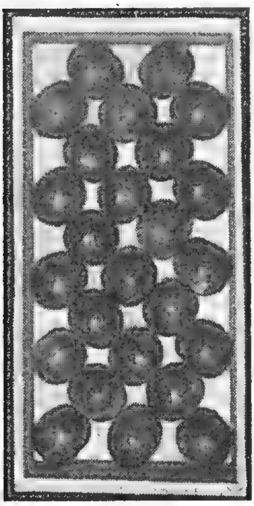


Finished Case.
193 Count. 3-2 Pack, 6 x 5 Layer Count. 7 Layers.

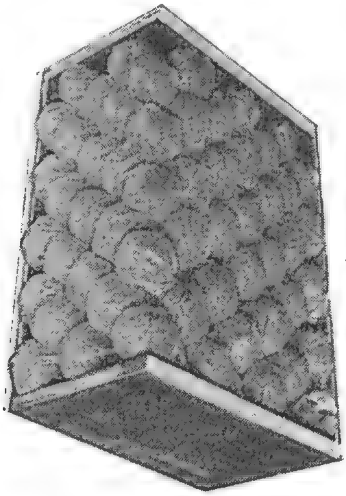
Note alignment of fruit across, diagonally, and end to end in the case.

Plate 76.

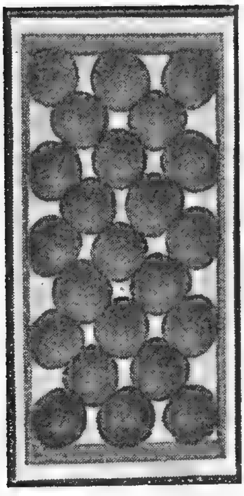
3-2 PACK. ALL 3-2 PACKS HAVE 7 LAYERS.



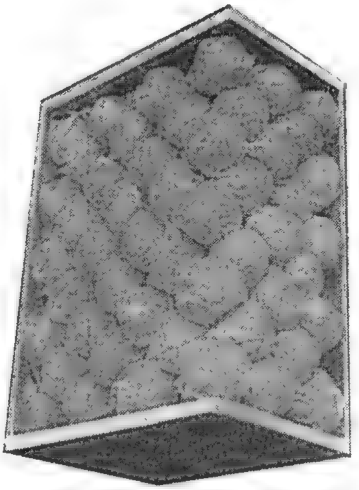
3-2 Pack, 5 x 5 Layer Count.
175 Apples.



Finished Case.
175 Count. 3-2 Pack, 5 x 5 Layer Count. 7 Layers.



3-2 Pack, 5 x 4 Layer Count.
158 Conical Apples only.

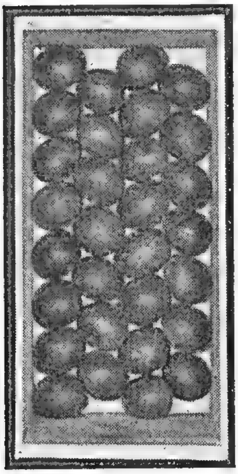


Finished Case.
158 Count. 3-2 Pack, 5 x 4 Layer Count. 7 Layers. Use for Conical Apples only.

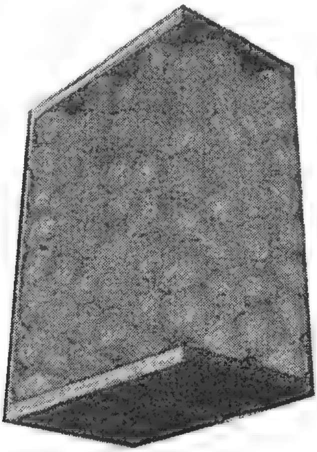
PLATE 77.

2-2 Pack.

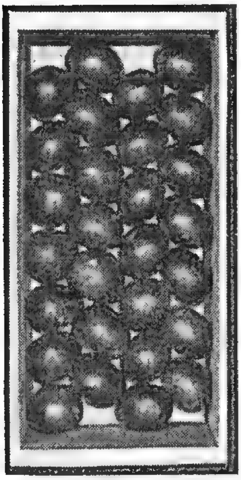
All 2-2 Packs have 6 Layers.



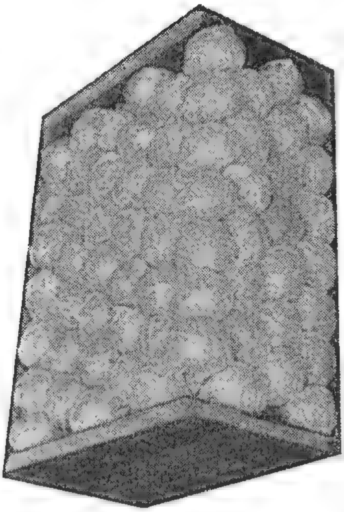
2-2 Pack, 8 x 7 Layer Count.
180 Flat Apples only.



Finished Case.
180 Count, 2-2 Pack, 8 x 7 Layer Count. For Flat Apples only.



2-2 Pack, 7 x 7 Layer Count.
168 Apples.

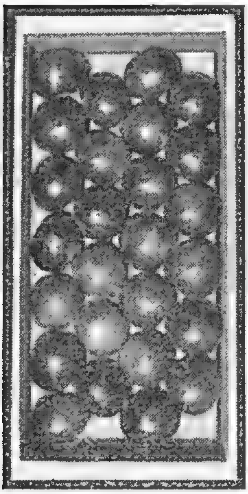


Finished Case.
168 Count. 2-2 Pack, 7 x 7 Layer Count. 6 Layers.

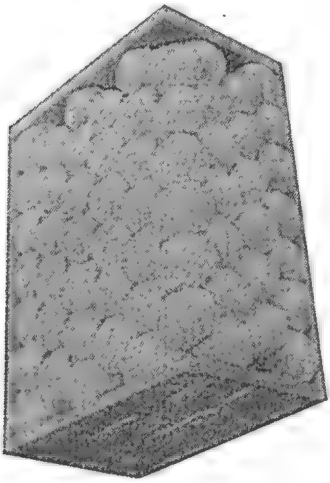
Note the alignment of the fruit across, diagonally, and end to end in the case.

Plate 78.

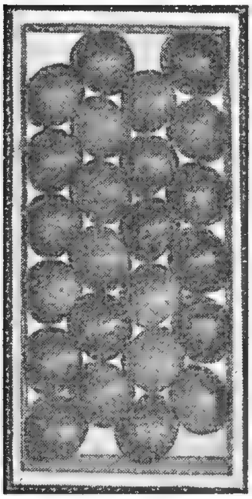
2-2 PACK. ALL 2-2 PACKS HAVE 6 LAYERS.



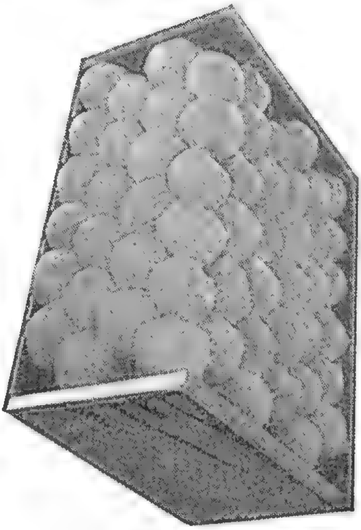
2-2 Pack, 7 x 6 Layer Count.
156 Apples.



Finished Case.
156 Count. 2-2 Pack. 7 x 6 Layer Count. 6 Layers.



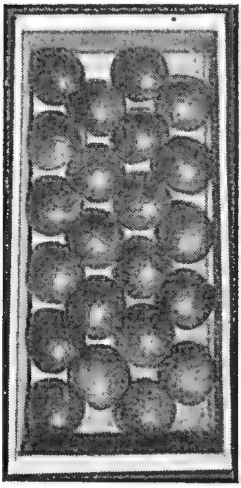
2-2 Pack, 6 x 6 Layer Count.
144 Apples.



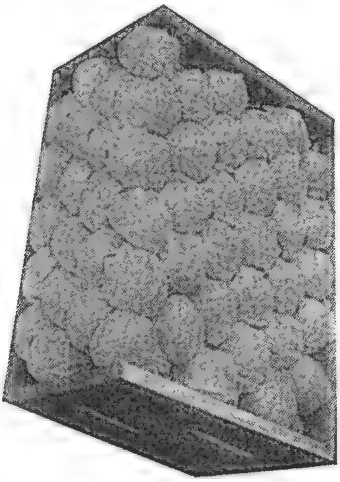
Finished Case.
144 Count. 2-2 Pack, 6 x 6 Layer Count. 6 Layers.

PLATE 79.

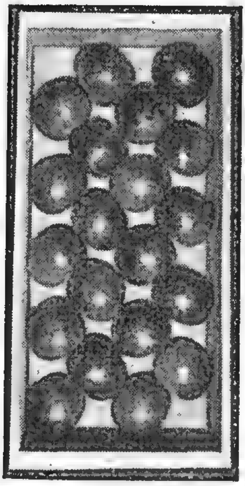
2-2 Pack. All 2-2 Packs have 6 Layers.



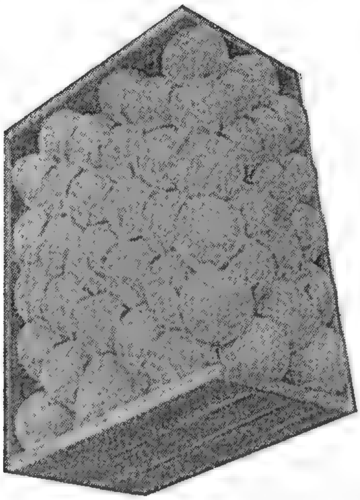
2-2 Pack, 6 x 5 Layer Count.
132 Apples.



Finished Case.
132 Count. 2-2 Pack, 6 x 5 Layer Count. 6 Layers.



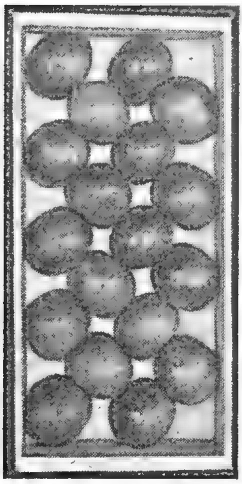
2-2 Pack, 5 x 5 Layer Count.
120 Apples.



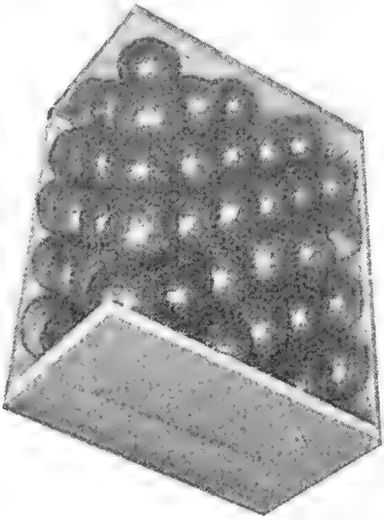
Finished Case.
120 Count. 2-2 Pack, 5 x 5 Layer Count. 6 Layers.

Plate 80.

2-2 PACK. ALL 2-2 PACKS HAVE 6 LAYERS.

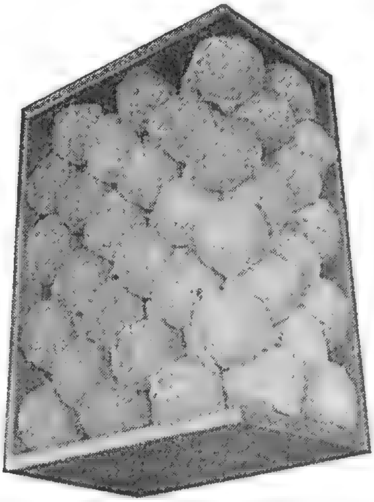


2-2 Pack, 5 x 4 Layer Count.
108 Apples.



Finished Case.
108 Count. 2-2 Pack, 5 x 4 Layer Count. 6 Layers.

96 Apples. 2-2 Pack, 4 x 4 Layer Count. For Conical Apples only.

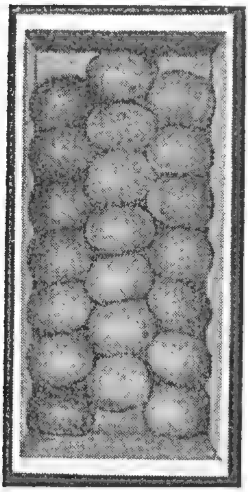


Finished Case.
96 Count. 2-2 Pack, 4 x 4 Layer Count. 6 Layers. For Conical Apples only.

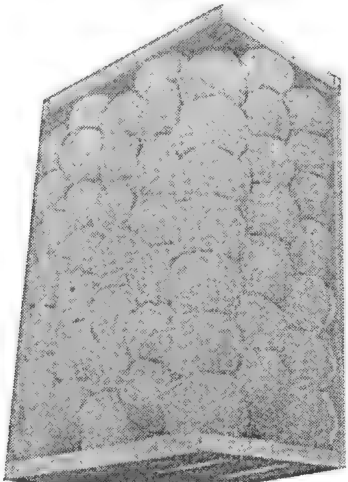
PLATE 81.

2-1 Pack.

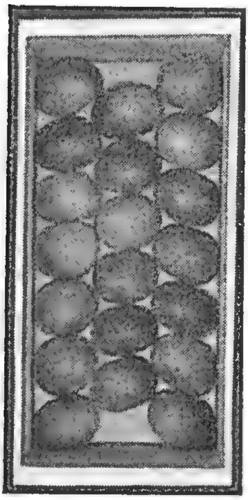
ALL 2-1 PACKS HAVE 5 LAYERS.



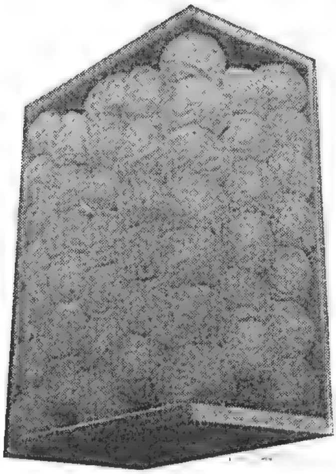
2-1 Pack, 7 x 7 Layer Count.
105 Flat Apples only.



Finished Case.
105 Count. 2-1 Pack, 7 x 7 Layer Count. 5 Layers.



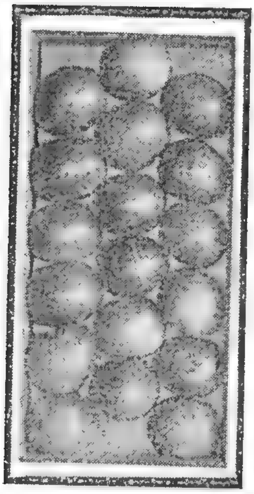
2-1 Pack, 7 x 6 Layer Count.
98 Apples.



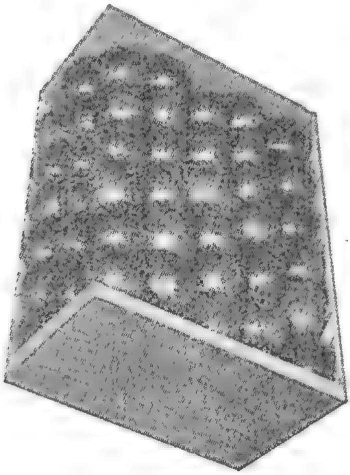
Finished Case.
98 Count. 2-1 Pack, 7 x 6 Layer Count. 5 Layers.

PLATE 82.

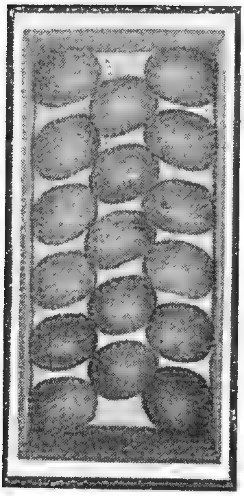
2-1 Pack. All 2-1 Packs have 5 Layers.



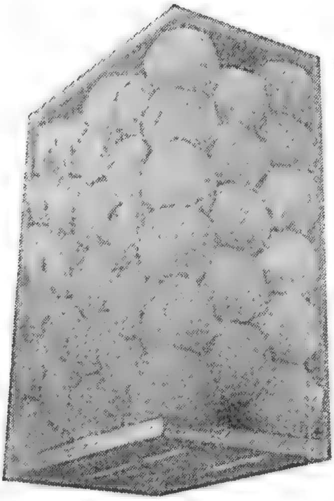
2-1 Pack, 6 x 6 Layer Count.
90 Apples.



Finished Case.
90 Count. 2-1 Pack, 6 x 6 Layer Count. 5 Layers.



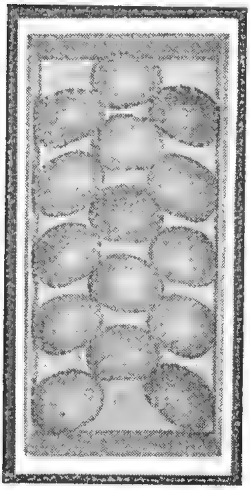
2-1 Pack, 6 x 5 Layer Count.
83 Apples.



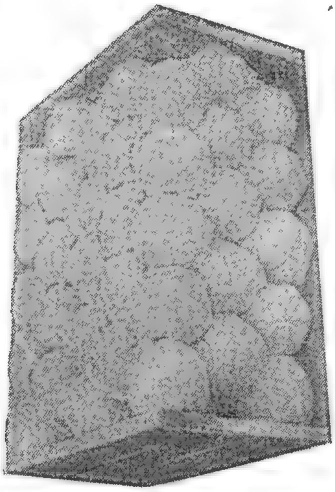
Finished Case.
83 Count. 2-1 Pack, 6 x 5 Layer Count. 5 Layers.

Plate 83.

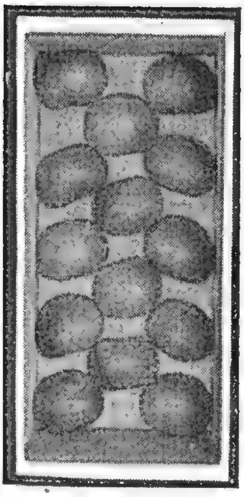
2-1 Pack. All 2-1 Packs have 5 Layers.



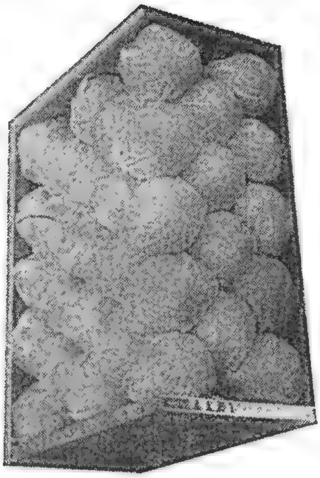
2-1 Pack, 5 x 5 Layer Count.
75 Apples.



Finished Case.
75 Count. 2-1 Pack, 5 x 5 Layer Count. 5 Layers.



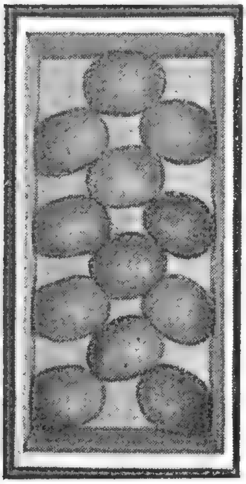
2-1 Pack, 5 x 4 Layer Count.
68 Apples.



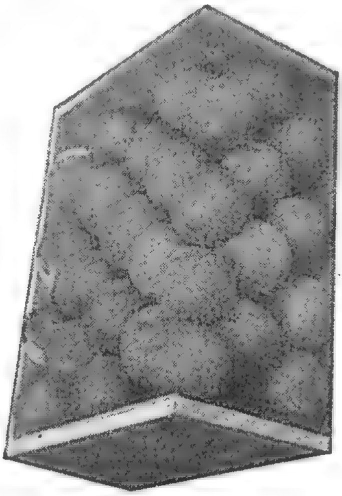
Finished Case.
68 Count. 2-1 Pack, 5 x 4 Layer Count. 5 Layers.

Plate 84.

2-1 PACK. ALL 2-1 PACKS HAVE 5 LAYERS.



2-1 Pack, 4 x 4 Layer Count.
60 Apples.



Finished Case.
60 Count. 2-1 Pack, 4 x 4 Layer Count. 5 Layers.

PLATE 85.

TANNING AND DYEING SHEEPSKINS.

After the pelt has been removed from the sheep spread it on an even surface, flesh side up, sprinkle salt freely on it, and rub it in hard. Let it remain on the floor until the salt dissolves, then make a strong warm suds, and wash the wool thoroughly. Let it get partially dry, then if the skin is a large one take 1 lb. of pulverised alum and mix it with 1 lb. of salt; mix in bran and water enough to make a stiff batter; spread it over the flesh side of the skin, then fold it in this manner (being careful to keep the wool on the outside). Turn the sides in until they meet in the centre. Let it lie so for two or three days, then shake the bran all off. As soon as it begins to dry work it by pulling and stretching over the top board of a fence (or a similar device). Continue in this manner until the skin is soft and pliable. After this is accomplished the wool is to be carded or combed. This is the most tedious process of all. Another tanning recipe is as follows:—First make a strong lather with hot water and soap; let it get cold, and then wash the skin in it, carefully squeezing out all dirt from the wool, after which wash it in cold water until all the soap is rinsed out, changing the water until the last is clear. Then put the skin in a tub, and pour over it two gallons of hot water in which has been dissolved 1 lb. each of salt and alum. See that the skin is completely covered, and let it soak for 12 hours. Then drain it well, and stretch it carefully on a board to dry, stretching it several times while drying. Before it is quite dry sprinkle on the flesh side 1 oz. each of finely pulverised alum and saltpetre, rubbing well in. Let it remain a day or two, and if the wool does not seem to be firm rub again with alum; fold the flesh side together, and hang in the shade for two or three days, turning over each day until quite dry. Then scrape the flesh side thoroughly with a blunt knife, and rub with pumice-stone until it is clean, and the skin will be ready for use. A good way to dye wool on sheepskins is by means of the prepared aniline dyes, which can be obtained from any chemist. Prepare the wool by washing the skin in a scouring mixture composed of 10 gallons water, 1 lb. soft soap, and 1 lb. common soda. Afterwards rinse in clean water, and treat according to the instructions which accompany the dye. Use a shallow vessel when dyeing if you wish to keep the dye off the tanned side of the skin.—"The Australasian."

Does Pig-Raising Pay?

By L. A. DOWNEY, Instructor in Pig-Raising.*

IN discussing the subject of whether pig-raising is a profitable undertaking, it is first necessary to look at the business of pig-raising in the correct perspective; thus one might ask the question: Why do we keep pigs?

Mankind is omnivorous, eating both vegetable and animal foodstuffs, and among his animal foodstuffs pork, either fresh or preserved, finds a place. The demand for pork and pork products as a food for man is so great that it could not be supplied from the world's herds of wild pigs, therefore, man has taken up pig husbandry so as to increase production and supply his wants and those of his neighbour. It has been found that in domestication pigs are very adaptable in most respects, and by altering their environment man has been able to alter the characteristics of pigs such as their rates of growth and reproduction, their carcass quality, and their food requirement per unit of pork produced. In fact, pigs respond to good environment and are much more productive under good domestic conditions than they were under natural conditions.

So obliging are pigs in regard to their diet that in many cases they have been asked to live and produce on foods which are not conducive to the best results; some people have gone so far as to consider the pig as a scavenger which will eat any kind of food in any condition. Thus we find pigs being used to dispose of waste products from dairies, slaughter-yards, kitchens, and such places. Peculiarly, pigs have put such foods to very good account and returned their owners good profits. When such waste products form the entire diet of pigs, the food cost is negligible and the return is mainly for labour, interest, and depreciation

Under conditions where foods are grown or purchased especially for the pigs, it is found that approximately 80 per cent. of the total production costs are accounted for by the foods. It will, therefore, be realised that pig-raising depends very largely on the food supply, its availability, and its cost.

A certain fairly definite amount of food is required to produce 1 lb. of pork. This figure is about 5 lb. of dry food for each pound of dressed pork, and it varies slightly according to the inherent quality of the pig, its diet, its environment, and health. Pigs require a plentiful supply of foods, which together should make a balanced and complete diet, in order to make a maximum growth per unit of food consumed, but it frequently happens that a ration not very complete or balanced can be provided at a much cheaper rate. This is often the case at piggeries where the buttermilk from butter factories is the main source of pig food; buttermilk alone does not make an ideal ration, but it is usually so plentiful and so cheap in certain seasons that it is more economical to use it entirely in the ration rather than use it in combination with grain to make a balanced ration.

The dairy farmer who keeps pigs merely to consume his separated milk is treating the pigs more as a convenience than as a business. On many farms pigs are fed in the summer entirely on separated milk, and

* In a radio broadcast from National Stations 4QG Brisbane; and 4RK, Rockhampton.

that milk usually has no market value other than what the pigs return for it. Under such conditions pig-raising pays almost at any price. In the winter time, however, those dairy farmers have a greatly reduced milk supply, and they must either keep less pigs or provide food in addition to the separated milk, in which case the pig-raising becomes more of a business in which the cost of production must be carefully watched.

It is possible for dairy farmers to keep more pigs and use milk in combination with grain and other foods in the summer, and then by the use of more grain and probably milk substitutes such as meat meal in the winter, the increased number of pigs could be carried throughout the year, but under such conditions pigs are not just a convenience and production costs and market values must be studied.

A number of pig-raisers in Queensland are now rearing pigs on grain and other home-grown or purchased foods, together with meat meal and entirely without milk; such ventures are really a means of converting crops into cash by way of the pig. It is generally assumed that one bushed of maize will produce 10 to 12 lb. of pork in average pigs, thus, when 10 to 12 lb. of pork is worth more than a bushel of maize, it probably pays to convert the maize into pork, provided other costs such as labour, interest and depreciation are taken into account. Under this system of pig-raising a long policy over a number of years must be followed, because seasonal variations in the market values of grain and pork might upset the balance temporarily, but the pigs must go on and cannot be starved for a time while maize is being sold at a good price, and then be fed to maturity at a later date.

A portion of the grain requirement of the pig's diet may be replaced by root crops, such as sweet potatoes or arrowroot or by pumpkins. All these crops usually give a greater return of pig food per acre than a crop of maize or wheat. For example, an acre of land that would produce 1 ton of maize should produce 9 tons of sweet potatoes, and the 9 tons of sweet potatoes, together with the vines and leaves, are approximately equal to 3 tons of maize as pig food. Thus sweet potatoes as a crop are about three times as valuable as maize for pig feeding, and would reduce production costs considerably if they were used to replace a portion of the maize in the pig's diet. It must be realised, however, that pigs do not grow so well on a diet composed mostly of bulky foods like sweet potatoes as when they receive a mixture of grain, sweet potatoes, and meat meal.

By grazing pigs on pasture or on forage crops such as lucerne, rape, cowpeas, and field peas, up to half of the grain and other concentrated food may be saved, but here again there is a limit to the pig's capacity to thrive on such cheap but bulky foods. It will be evident, however, that the farmer who grows most of his pig food can, by a judicious selection of crops, increase the pork production per acre to a maximum, thus lowering his production costs. Another way of reducing costs is to so arrange the piggery that at least a portion of the crops can be harvested by the pigs themselves, thus effecting a saving in labour and retaining fertility in the cultivation paddocks.

After having provided for a cheap food supply, the pig-raiser should aim at having his pigs in such condition that they will make the best use of the available food. The efficiency with which pigs convert their food into pork depends on the inherent quality of the stock. Some pigs

require more food than others to make 1 lb. of pork, even when kept under similar conditions; hence, the selection of breeding stock to produce good quality pigs has a marked effect on the profit or loss of pig-raising.

As prolificacy is inherited in pigs, care should be taken to select productive breeding stock, as the number of pigs reared per sow also affects the production cost considerably.

The environment in which pigs are kept affects their food consumption and rate of growth. Comfortable and hygienic accommodation, which safeguards the health of pigs, provides for greatest efficiency.

Having dealt with factors affecting the production cost of pork, I will now refer to market values of pork. In this respect one cannot say what values will be in the future, but we can refer to prices in the past.

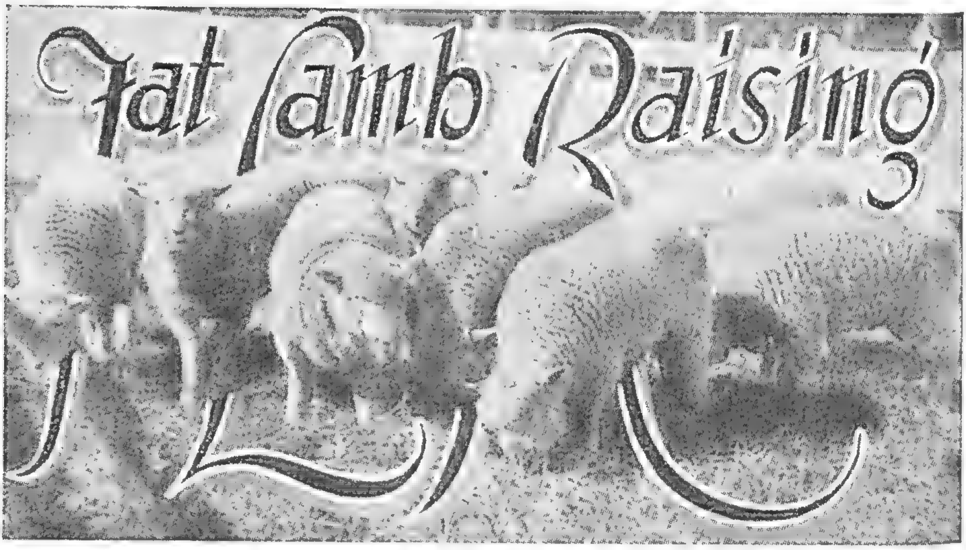
From records of prices paid by Queensland bacon factories for prime bacon pigs on a dressed weight basis at country loading depots, we see that during the last eight years prices ranged from 3¼d. to 8½d. per lb., that is equal to a range of from £1 12s. 6d. to £4 5s. for a top weight pig of 120 lb. Such a big variation would be most upsetting in any calculations to estimate probable returns from pig-raising. However, there is marked difference in the prices of the last four years and the previous four years. During the period 1927 to 1930 inclusive, pork prices ranged from 4¾d. to 8½d., while in the period 1931 to 1934 inclusive, prices ranged from 3¼d. to 6½d., the average price for the earlier period being approximately 6d. and for the latter period approximately 4d.

One significant fact in the price chart over a number of years is that prices invariably fall rapidly in autumn and reach their highest peak in the spring; this is the result of our reliance on separated milk as the main source of pig food. The dairy farmers' pigs flood the autumn market and meet low prices, then they have very few pigs ready for market in the spring because they have depended mainly on milk for their pigs, or in other words, they have used the pigs merely as a convenience to dispose of their surplus milk in the summer.

This flooding of the market in the autumn makes it bad for the pig-raisers who do not feed largely on milk, but they get their share of the good prices in the spring provided they have made provision for a fairly regular food supply throughout the year; this class of pig-raiser can, therefore, reckon on a somewhat higher average pig price than the dairy farmer receives.

Having a satisfactory degree of efficiency in breeding and general management of pigs and the most economical food supply, pig raisers should keep a constant watch on the balance between food costs and pig prices, knowing that to produce a given amount of pork a certain minimum of food will be required.

So the answer to whether pig-raising pays is "yes," under some conditions, but it is necessary to understand the conditions under which a business is operating.



SHEEP RAISING ON SMALL HOLDINGS.

By JAMES CAREW.

SHEEP are conspicuous by their absence on small farms in Queensland, except on the Darling Downs. The general idea is that a large area of country is necessary, and, even then, that sheep should be run chiefly for wool production. That is in keeping with western conditions in the lower rainfall belts, but near the coast the method should be to sell as fats all surplus sheep that can be spared. If they cannot be sold as fat lambs then as soon after as possible; and in this respect crossbreds are more suitable than merinos. Besides selecting the more suitable breeds, the method of management has an important influence on the success of the undertaking. There are disadvantages, of course, such as sheep being a nuisance by getting through fences, and losses through parasites and dogs. If sheep formed part of the stock on all farms, provision would be made to secure them properly, domesticated dogs would become more accustomed to and consequently more friendly towards them. Usually when mutton and wool are low in price sheep are considered not worth keeping, and when values are high the customary prices for stores are considered too great.

Most farmers are anxious to buy when wool and mutton are high, and if a cheap lot of sheep are available for purchase they are bought—the trouble some one is anxious to get rid of being probably included in the bargain.

Any farmer planning to commence sheep-raising should first select a block of country, a portion of which is high and well drained, and secure it with netting. The area should be sufficient to meet ordinary requirements for the business. A substantial portion of the land should also be suitable for growing the crops necessary for fattening purposes. As merino ewes are always available at market rates, they are, under our present conditions, the most suitable to start off with. Purchase

Plate 86.—Typical Merino Ewe.

western ewes of the large plain-bodied type which may be cast for strength or age. The breed of ram should be selected to suit the locality, but for purely farmers' sheep the Romney Marsh and Border Leicester will fill the bill.

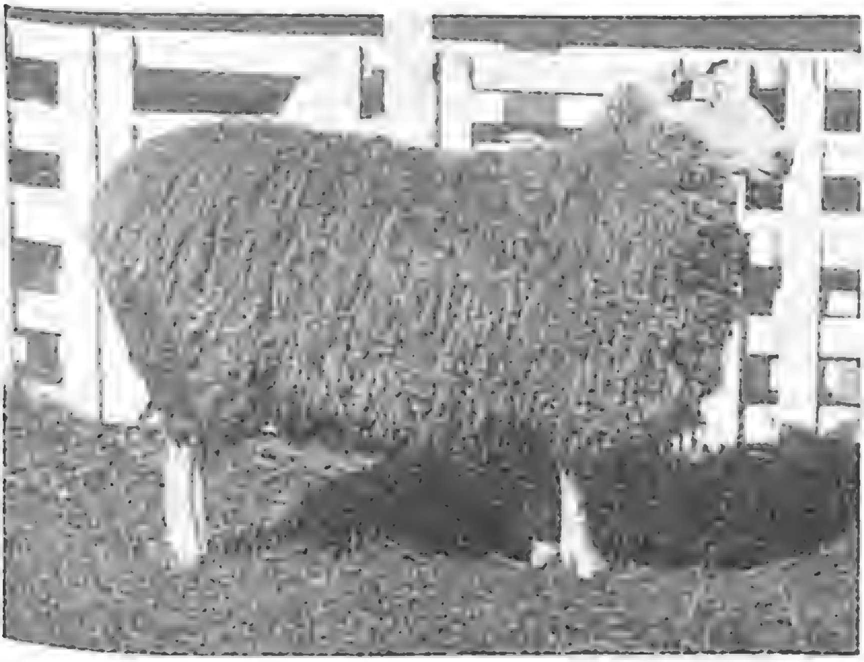


Plate 87.—Border Leicester Ram.

The Romney Marsh may be run successfully on practically all the country within 30 miles of the seaboard, and for all the low country even extending over the main range. The Border Leicester is the breed for the higher land, particularly the Darling Downs and tablelands. Either of these breeds when mated with the merino produce good dual-purpose progeny which develop into good mothers. If conditions are suitable they fatten at four and a-half to five months, and dress up to 35 lb.

If the ewe lambs are retained for breeding purposes (and they should be), they develop into good wool producers as well as having a good carcase for the butcher.

The advantage of keeping sheep for home supplies is also an item of interest worth considering.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 8th August, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

The following is the list of lectures for August and September, 1935:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Thursday, 8th August, 1935—"Care and Management of Growing Chickens," Part II., by J. J. McLachlan, Poultry Inspector.

Tuesday, 13th August, 1935—"Selling Our Scenery," by J. F. F. Reid, Editor of Publications.

Thursday, 15th August, 1935—"When the Cows Come Home," by J. F. F. Reid, Editor of Publications.

Tuesday, 20th August, 1935—"Avocado Growing," by H. Barnes, Director of Fruit Growing.

Thursday, 22nd August, 1935—"Harvesting and Marketing Tomatoes," by J. H. Gregory, Instructor in Fruit Packing.

Tuesday, 27th August, 1935—"The Necessity for Culling and its Advantages," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 29th August, 1935—"Bush Hay," by N. A. R. Pollock, Senior Instructor in Agriculture.

Tuesday, 3rd September, 1935—"Fungicides and Disease Control," Part I., by J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 5th September, 1935—"Fungicides and Disease Control," Part II., by J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 10th September, 1935—"Fungicides and Disease Control," Part III., by J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 12th September, 1935—"Salt Bushes," by C. T. White, Government Botanist.

Tuesday, 17th September, 1935—"Chloris Grasses," by S. L. Everist, Assistant to Botanist.

Thursday, 19th September, 1935—"Manures and Fertilizers," by E. H. Gurney, Agricultural Chemist.

Tuesday, 24th September, 1935—"Brains in Farming," by J. F. F. Reid, Editor of Publications.

Thursday, 26th September, 1935—"Kilkivan to Kingaroy—An Epic of Pioneer Settlement," by J. F. F. Reid, Editor of Publications.

Crutch Strike by Blowflies in Sheep.

A Preventive Operation.

By J. H. W. MULES.

IN 1928 the writer bred a very dense, strong-wooled stud ewe lamb. In November of that year flies attacked the lamb, and the conformation of the crutch wrinkles was such that as the animal grew the wrinkles closed up the channel below the vulva almost completely, with the result that the lamb could not urinate without befouling itself. Despite continued attention the lamb was struck repeatedly, and one was faced with the fact that as the lamb then appeared she was likely to become a constant source of worry. She promised to be an exceptionally heavy cutter and a possible show sheep, and it was feared that the continual treatment necessary to keep her free from maggots would tend to stunt her growth and impair her constitution generally; so, summing up the position, I decided to remove the offending wrinkles with a pair of Burdizzo pincers. In performing this operation, the skin was removed by applying the pincers to the wrinkle at its base and cutting the fold or wrinkle off inside the jaws of the pincers. It was found that the pressure applied was so great that the two edges of the skin at the base of the wrinkle were cut so cleanly that there was no bleeding whatever. The use of this instrument in performing this operation on high-class stud sheep is, therefore, recommended, but I consider it too heavy and slow for general pastoral work. The result of the operation on the ewe weaner was such that she had no further attraction for blowflies and remained free from strike for several years. When this interesting result manifested itself I set out to learn why it was that the weaner was apparently immune, and decided to remove the verticle wrinkles from every female in the flock, enabling them to urinate without wetting the wool. The result of this operation was precisely similar to that of the first lamb treated, and the entire flock remained free from any strike for a period of nearly three years, after which no records were kept and the sheep passed into other hands.

It was necessary to know why the sheep did not attract flies, and sections of skin were placed as near as possible representing what appeared to be different degrees of susceptibility; and, although no complete test was made, it was found that there were apparently degrees of susceptibility, as shown by the number of flies attracted to the various sections set out, side by side, but not touching each other. It was also discovered that what might appear to be a perfectly normal piece of skin to the naked eye might be highly susceptible and might be a definite case of dermatitis. Dr. Bull, in taking skin for specimens, took one sample of what appeared to be normal skin for comparison, but on microscopical examination this specimen proved to be highly infected, with sufficient minute ulcerations to cause the lamb, which was about four weeks old, to be susceptible. This discovery caused Dr. Bull to ask me to try to find out how long it would take the continual wetting of the skin by urine to cause ulceration and susceptibility. This determination was reached by tying the wool together across the crutch just below the vulva, and in such a way that the urine reached the skin by capillary attraction. After a daily examination for twenty-one days, it was found that the lamb was struck, so that it is assumed that in lambs, say, two

months old, that period of time was required to cause susceptibility in this way. I think, however, that in older sheep with tissues less delicate the term may be longer—possibly four or five weeks. It was also shown that by removing one wrinkle the lamb would be struck on the remaining area, and so it became possible to cause the lamb to be struck on either side at will. It was, therefore, assumed that fly strike could be controlled to a large extent, and so all the possibilities were examined which the foregoing experiments opened up for further investigation. The question which naturally presented itself was: How can ewes be prevented from befouling themselves? The answer was obviously: By cutting away all obstructions to a clear drop to the ground of all urine. In the cases of normally formed ewes with perfect vulvæ, this is quite easily and quickly done by surgical removal of all surplus and obstructive skin in the crutch. There are, however, several factors which contribute to befouling, and which now enter into this discussion.

Side Delivery or Distorted Vulvæ.

In the case of side delivery, the vulva is so distorted from its normal position as to cause the urine to reach the wool on the wrinkle on one side more than the other. This distortion may be pre-natal—*i.e.*, it may be that the lamb is a thick-skinned lamb with a broad flange on the tail opposite the vulva, and that the lamb's position prior to birth may be such that the tail presses on one side of the vulva more than on the other, and so the parts of lamb merely become moulded to that form resulting from the growing tissues taking the line of least resistance. The vulva yielding to the pressure of the tail may consequently develop sideways. My observations have, in my opinion, established definitely that distortion of this nature is determined before birth. This malformation is due to the breeder of the sheep seeking just a little more density of wool than the breed can accept and remain perfect in all its conformities. I say this because the broad tail is the cause of the distortion, and a thin-tailed lamb seldom or never suffers this form of distortion.

Distortion of Vulvæ after Birth.

Malformation of vulvæ after birth may be from one of two primary causes, viz.:—(1) Pressure of tail which has not been cut short enough; (2) contraction of skin due to scabby ulcer, with which I shall deal later in this article.

We will take the distortion by pressure of tail first. When a tail is cut so long that it presses on and over the vulva, it almost invariably makes a position for itself on one side or the other, and in time the vulva becomes set in the position assigned to it and is permanently directed sideways. In the case of very fat lambs from birth, the fullness of the flesh and fat on either side of the vulva makes the position of the vulva difficult for the tail to displace, and it is not uncommon in these cases to find that the vulva is lying in an absolutely central position, but instead of pointing downward is pointing upward, with the result that Nature's provision for natural, clean drainage is rendered useless for that purpose, with the further result that the last few drops of urine run down the skin, and the upward distortion of the vulva causes splashing to the sides, and so leads to early susceptibility to fly strike.

Distortion of Vulvæ by Contraction of Skin by Erosion of "Scabby Ulcer."

Distortion of vulva by erosion of "scabby ulcer" is a common cause, and is due to there being insufficient air to dry the vulva and the tissues in its immediate vicinity after urination. Distortion of this nature only occurs when the ulcerated area appears on the side of the vulva, and no distortion usually takes place until the sheep is crutched or is subjected to a "dewrinkling" process. It is when the ulcerated area is healing that the contraction of the skin pulls the vulva to one side, and thus the sheep remains imperfect and subject to "side delivery."

Treatment for Distorted Vulvæ.

(*a.*) When distortion is pre-natal, and the tail is cut to reach no lower than one-sixteenth of an inch above the lips of the vulva when healed, the distortion can be permanently set right by making an oval cut and removing a portion of skin on the convex side of the organ. The piece cut out may have to be of various sizes corresponding with the degree of distortion, but the contraction in the course of healing will do the job nicely. This operation can be done with a sharp pair of scissors or with "Rolcut" secateurs, or with sharp dagging shears. Care must be taken not to cut too deeply, but a very small portion of tissue besides skin may be removed without bungling the operation.

(*b*) When distortion is caused by tail pressure, the tail in grown ewes must be recut to reach no lower than clear above the lips of the vulva. In recutting, the skin of the tail should be pressed up towards the butt and the bone cut shorter by nearly half an inch than the skin; this enables the skin to completely cover the bone when released. The main artery of the tail should be touched with a hot iron to stop bleeding in grown sheep.

(*c*) The distortion of vulvæ by "scabby ulcer" is not apparent till the scabby area is healing or has healed, and the treatment varies slightly. An area as near as possible equal in size to the area of the ulcer should be pinched out on the side of the vulva opposite the ulcer, and the ulcerated area should be treated with a rough rubbing with rock bluestone. In this case the incision is made a preventive measure, for otherwise the contraction of the skin of the scabby side would do what the operation would do—you equalise matters and the vulva remains in a central position.

"Scabby Ulcer."

Scabby ulcer is a term I have used to define the brown scab caused by the action of urine on the skin of sheep. At the present time not much is known about the actual agent which causes it, but this will probably be determined by the bacteriological staff at Yeerongpilly. It is sufficient to say for the present that "scabby ulcer" shows on the whole of the area on which urine flows for any length of time. The ulceration forms round the point of the vulva in many cases, and it is almost certain that, if not removed, it will completely dissolve and errode the point of the vulva till it entirely disappears. This condition I have described as "stubby vulva"—a vulva that will not drip, but drains the last few drops of urine which flows over and percolates down the channel immediately below it. A vulva so conditioned is almost certain to cause the ewe to become susceptible to fly strike, and, in my opinion, if shearers always realised the very serious results of cutting off the tip of vulvas

accidentally, or possibly carelessly, in the course of shearing, they would take every care to obviate it. Many vulvas are cut in shearing, but many are also lost through the ravages of "scabby ulcer." Shearers are often blamed wrongly, however, for what is merely the result of disease. "Scabby ulcer" is far-reaching in its effects, and there seems to be no doubt about its influence on fly strike susceptibility among ewes. A thorough investigation of "scabby ulcer" as, probably, a definite cause of ewes becoming chronic urine-dribblers, and consequently highly susceptible to fly strike is, in my opinion, well warranted. It is the ewe with the "stubby vulva" that gets struck low down on the crutch, and sometimes on the udder.

So far as is known, urine percolating to the skin is mainly the cause of dermatitis, or fever of the skin in the crutch. The yolk glands and follicles of the wool become affected, and the temperature of the skin rises. Exudations are retained on the surface of the skin by wool fibres, and the surface of these exudations oxidises. Meanwhile, the exudation continues under the oxidised or solidified surface, and there eventually becomes a crumbly, cheesy (in appearance) mass of pabulum or food suitable for the larvæ of blowflies. The affected parts, at varying stages, become what is commonly known as a susceptible area. This exudation is what attracts the fly.

It is no part of my intention to write of the habits of blowflies, but I might here state that, unless a ewe is susceptible, she will not suffer seriously from blowfly attack.

The obligation is therefore on stockowners who breed sheep of such a type that they cannot remain insusceptible to protect them by rendering them immune from attraction to flies. This can be done in two ways. Firstly, by Dr. Seddon's "breeding-out of wrinkles" process; and secondly, my method now known as Mules' Operation.

The Operation Described.

I now propose to show how a sheep may be kept free from normal fly strike for the term of its life by rendering her free from susceptibility.

The operation necessary to do this is simple, and is based on the need for dryness instead of moisture in the crutch and below the vulva. It consists of the removal of any wrinkles or "surplus" skin in the crutch and around the excretory organs of the sheep that are likely in any way to obstruct the flow of urine; but apart from that as a main object the aim is also to "aerate" that part of the sheep in a general way, by the removal of loose skin, to the end that it will become and remain dry at all times. Many stockowners simply cut the wrinkles off with shears; others use the Burdizzo pincers, but Rolcut secateurs are probably the most suitable instrument on the market for the job. The lamb is held as for tailing, and the operator then cuts the two wrinkles nearest the vulva and running in a line from the hock to the base of the tail. The wrinkles should be cut from the tail to as low as 4 to 6 inches below the vulva, and should be completely removed, leaving the lamb's skin quite plain in the vicinity of the operation. Where it is obvious that wrinkles further away towards the side of leg will tend to close the wool in behind the sheep, and thus make a second operation necessary, it will be as well to remove those wrinkles also as a precautionary measure. Care must be taken to cut no area of the bare skin close to and below the vulva. The cutting blade should

cut on the wool line, and in this way stretch if anything the bare area in the process of contraction by healing. It must be remembered that flies will blow meat, and, although I have never yet heard of a cut wrinkle being blown, I think that it is advisable at all times to put a little dressing on in the form of any reputable fly dressing. The Mules' Operation consists of four essentials:—

(1) Removal of wrinkles (this can be done at the rate of five lambs per minute easily);
(2) Treatment of "scabby ulcer" by bluestone dressing or cauterising;
(3) Straightening up distorted vulvas by means of a minor operation;
(4) Shortening of tail to a point just above the lips of the vulva, the cutting of the tail to be done in such a way that an overlap of skin is available to cover the end of the tail loosely, thus obviating the "dimpling" at the end of tail, where fly strike sometimes occurs.

Conclusion.

In concluding, I would like to state the following facts:—Ewes may be treated irrespective of age. If well treated, they will never befoul themselves. If they remain dry, they will not be struck in normal times, but if not kept dry in the crutch, they will certainly be struck.

The skin of lambs varies. The variation may be in the same breed or strain, and it certainly is highly pronounced in the different merino strains. Taken generally, the Peppin strain has a thick, firm skin of fine texture with small "ribby" wrinkles all over the body. The South Australian type, into which no Peppin infusion has been made, has quite a different type of skin. It may be termed an elastic skin loose on the sheep, and not so firm to handle. It is not uncommon for a shearer who has been shearing Peppin sheep to have to alter the points of his combs before he can shear comfortably sheep of another strain. When the operator grasps the skin of a lamb to remove it, if he is a student of stud-breeding he can tell immediately whether the lamb will grow skin or grow out of it. No hard-and-fast rule for guidance as to this knowledge on the part of breeders can be given, because it is an accomplishment that can only be acquired through years of stud-breeding experience; but, as a general rule, a robust, thick-skinned lamb will grow skin, and a thin-skinned ("wastey to the feel") lamb will not develop more wrinkles as it grows. This rule is upset when lambs are under-nourished at the time of treatment, and plentiful feed after treatment may cause a growth of skin; so it is always advisable when there is a doubt to make sure and take plenty of skin off.

The cuts should be made from not less than half an inch above the vulva to as low as may be required. They should be long and narrow, for wide or round cuts cause puckering and infolds. Very wrinkly lambs or ewes require a cut right from tail downwards. No sheep is so plain that it cannot be made plainer by this process, and it is my belief that the least susceptible type, as represented in Dr. Seddon's A class, can be rendered still less susceptible by the treatment under "Mules' Operation."

The Giant American Toad (*Bufo marinus*).

By R. W. MUNGOMERY.*

THE giant American toad, which, until recent years, was restricted to the tropical and temperate parts of South America and certain of the West Indian Islands, first came forcibly under our notice when Mr. Arthur F. Bell visited Puerto Rico as the official Queensland Government representative at the Fourth Conference of the International Society of Sugar Cane Technologists held in San Juan in 1932. There he was able to see large numbers of these toads successfully operating against the Puerto Rican cane beetle in their newly adopted country, and, of course, the value of such an important predator immediately became apparent. At this conference Mrs. Dexter presented to the members of this society a paper detailing the feeding habits of this giant of the toad family. Its diet was found to be both varied and extensive, whilst it possessed an enormous capacity for food. This carefully prepared census of the toads' victims was obtained as a result of the examination of the stomach contents of several hundred specimens which had been captured in various parts of the island and killed with the above object in view. The examination revealed that of those insects that had been eaten, and whose undigested remains were able to be identified, approximately 51 per cent. were harmful species of insects, 42 per cent. were neutral, *i.e.*, neither harmful nor beneficial, while the remaining small percentage of 7 per cent. proved to be beneficial species.

So impressed were some of the visiting delegates with the possibilities of this animal becoming an important factor in the control of some of the more serious cane pests in their respective countries that they immediately made arrangements to take with them, on their departure, consignments of these toads in order that this useful predator might similarly become established in other parts of the world and continue there its good work.

The toad is a native of tropical America, extending from Mexico to the Argentine. From French Guiana it was introduced into Barbados prior to 1850, primarily with the object of preying on young rodents which at that time were inflicting great damage on the cane crops of that island. It is not reported to what extent they were successful in rat control (possibly of little value); however, their effect on insect control was very marked, and from there they have been spread to most of the West Indian Islands, including Puerto Rico in 1920. From Puerto Rico they were taken by Mr. C. E. Pemberton, Entomologist of the Hawaiian Sugar Planters' Experiment Station, to Honolulu, where they rapidly multiplied, and they are now well established in different islands of the Hawaiian group. They have since been sent to the Philippines for colonisation in the canefields.

We, in our turn, have watched with interest the successful establishment of this toad in several new countries, and the gradual suppression of some of the major pests in areas where it has been operating for longer periods, and where its population has reached saturation point. We have also been impressed with the possibilities of such an animal operating against our indigenous cane beetles, and some of our other

* In the "Cane Growers' Quarterly Bulletin" for July (Bureau of Sugar Experiment Stations).

major sugar-cane pests. The writer's recent visit to Hawaii was made, therefore, primarily with the object of studying the toad in an invironment which has proved particularly favourable for its natural spread, and to bring back sufficient toads to ensure their successful establishment in Queensland. Accordingly, this latest importation of the toad into Queensland will mark another step in the gradual conquest of the warmer regions of the earth by this remarkable animal, and this has been made possible through the courtesy and valued co-operation of the Director and Entomologist of the Experiment Station of the Hawaiian Sugar Planters' Association.

Plate 88.—A Giant Toad, Half Natural Size.

When full grown, *Bufo marinus* is from 6 to 8 inches in length, and usually from 4 to 5 inches in breadth. The colour varies considerably, but it is usually of an irregular yellowish, reddish, or blackish brown, being darker on the back than on the underside of the body. On each side, just behind the head, they are armed with a conspicuous poison sac. This sac is mainly for defensive purposes, as is evidenced when a dog or other animal picks up a toad in its mouth. The dog soon drops the toad in disgust, curling up its lips, and salivates profusely, as if it had suffered some unpleasant sensation. This experience usually suffices to cure the dog of any further desire to molest a toad.

The skin on the back of the female toad is somewhat warty, but smooth, whilst the males have a much rougher skin, due to several raised tubercles, which give it a feeling somewhat similar to a fine grade of sandpaper. For much of the foregoing and following information the writer is indebted to Mr. Pemberton, who has carried out most of the detailed feeding work in Hawaii, and who also has shown the writer these toads operating in various suitable localities around Honolulu.

No complete life history notes are available concerning the toad's development, owing to the fact that it has not yet been possible to induce this species to breed under confined conditions. However, from observations in Hawaii and Puerto Rico, it is apparent that they lay their eggs practically throughout the whole year when they find suitable conditions, and they mature in about a year. We should therefore expect them to behave similarly in North Queensland, and that eggs would be found most plentifully during the rainy period, November to April, when waterholes generally are full of water.

For their establishment in Hawaii two colonies were liberated, each consisting of from 60 to 70 individuals. One colony was turned loose in the upper reaches of the mountain streams which flow down Manoa Valley, and the remainder were given their freedom in a pond adjacent to a low-lying rice field near Waipio. In both cases they have bred successfully, and can now be found far away from the original points of liberation, whilst they appear to be adaptable to a fairly wide variety of conditions. In the low-lying areas they have multiplied most rapidly, and at the present time young toads are being distributed from Waipio at the rate of 1,000 to 3,000 daily. During last year strings of eggs containing as many as 12,000, which had been laid by one female, were sometimes collected in the waterlogged rice and taro fields, and these were hatched out in a specially constructed pond at the Waipio sub-station by officers of the sugar experiment station. The tadpoles usually hatch out two or three days after the blackish eggs are deposited. They are then about $\frac{2}{5}$ of an inch in length, and they remain congregated together before they separate to feed on the small aquatic plants that are commonly found growing in such situations. It has been found that the tadpoles feed readily on boiled rice, oatmeal, or other finely-ground cereal, and it has been possible to hasten up the tadpole period to three weeks as against the normal period of one month. In their normal rate of development the tadpoles develop a pair of fore-legs towards the end of the first fortnight, whilst some few days before they are ready to leave the water the hind pair of legs make their appearance and the tail is gradually absorbed. When this stage is reached the young toads are still only very tiny—just a little over $\frac{1}{4}$ inch in length—and one would scarcely imagine that they are ultimately to grow into such huge creatures as are now seen in the fields or on the garden lawns around Honolulu.

They feed on ants, small vinegar flies which frequent rotting fruit, and, in fact, on any insect which they are large enough to swallow. One consignment of small toads, which were placed out in a large field of young cane infested with "armyworms," immediately impressed the plantation agriculturists by commencing operations against the young caterpillars, which they snapped up, and though unable to accommodate a whole caterpillar, a young *Bufo* toad would be seen to remain there with portion of the caterpillar protruding from its mouth, apparently unconcerned, but well satisfied that it would ultimately accomplish the task before it. Most of their feeding is done by night, and during the day they can frequently be found hiding in the small holes which surround the banks of irrigation ditches. They grow very rapidly and soon learn to consume different kinds of insects, and there is evidence to show that they regularly visit the same spots at which they have been in the habit of making easy captures of large numbers of insects.

In fact, about the only bad point raised against them is that they sometimes loiter near hives of honey bees and jump up and catch the heavily-laden bees returning to the hives, but this can easily be remedied by raising the hives to a height of 2 feet or more from the ground, or by surrounding the hives with small mesh wire netting. As most of the bee-hives in Queensland are usually placed more than 2 feet above the ground this introduction of *Bufo* should not prove any serious hardship to Queensland beekeepers.

Their normal diet consists of all kinds of beetles, cockroaches, mole-crickets, weevils, caterpillars, centipedes, sowbugs, and the like, and the toad will usually snap at any moving object that attracts its attention. It is an amusing sight to watch a toad snap at a centipede, and with one-half of the creature down its throat and the other half protruding from its mouth the toad quickly uses its forelegs to assist in pushing the remainder of the centipede effectively out of view down its huge throat. Centipedes apparently have no ill effects on the toad, neither does the ''black widow'' spider, a very venomous species which was recently fed to a toad, and which produced no harmful effects whatever on the toad that consumed it.

Certain individuals have raised the question of the toads possibly proving a nuisance owing to the noise they will make. Their call is not objectionable, and certainly not as loud nor as shrill as that of many species of frogs which are indigenous to Australia. It has sometimes been described as being similar to the distant sound of a motor cycle, of that regularity, but more musical. The writer can best describe it as being similar to the latter part of the call of the brown pheasant-coucal, which is commonly found in most Queensland canefields.

To others who scent a ''nigger in the woodpile'' and suggest the possibility that the toad will, in turn, itself become a pest, we can point to the fact that nearly 100 years have elapsed since it was first introduced into Barbados, and there it has no black marks against its character. Experience with it in other West Indian islands, and in Hawaii, certainly points to the fact that no serious harm is likely to eventuate through its introduction into Queensland.

We, however, wish to raise one important note of warning. This toad, though large, is not the edible species of frog, **and it must not be eaten.** The glands at the side of its head secrete a digitalis-like poison, adrenalin, and other more obscure poisons, and if the toad is eaten the net effect of these poisons is apt to have a very serious effect on the heart. Whilst the writer was in Hawaii a young Filipino child died, and it was alleged that she died as a result of her parents giving her a portion of a toad to eat. Whether these facts are true or not is difficult to ascertain, but this example should be sufficient warning to deter anyone so minded towards a dish of the famous French delicacy to defer it until the edible variety of frog is available, and certainly to give *Bufo* a wide berth.

From Manoa Valley the toads have spread of their own accord down to the city of Honolulu, and at night many individuals from small to nearly full-grown can be seen on the lawns in the residential section, whilst at other times an unfortunate toad can be found dead on the road, having been run over by a passing motor car. At Waipio dozens of smaller ones can be seen hopping along the edges of the irrigation

reservoirs, whilst in shallow shady ponds, where hyacinth and taro are growing, as many as twelve nearly full-grown specimens can be counted hanging around the base of one taro clump. Other taro plants similarly harbour a large number of toads at their bases, and when it is remembered that up to 3,000 toads are daily distributed from this centre it will be apparent to what extent these animals have multiplied during the three years since they were first liberated in these localities. Pools of water are necessary only for the egg and tadpole stages, and once the young toads have forsaken the waterholes they are able to grow up and flourish without having regular access to water. This is evidenced from the fact that toads are often found far distant from any streams or ponds.

The toad has proved a very popular introduction into Hawaii, both amongst the sugar-cane plantation managers and amongst the resident population of Honolulu, and requests are ever forthcoming from them for liberations of toads to be made on their respective properties. Many of the garden owners are loud in their praises of the good work which the toads are doing, and they report a decided decrease in the incidence of many kinds of pests this year. Many garden plants, such as roses, cannas, lettuce, &c., which were severely damaged by the small Asiatic beetle, now show very little injury in places where toads are common. Although it is unwise to draw conclusions too hurriedly as to the benefits resulting from the introduction of *Bufo marinus,* as weather conditions are known to have far-reaching influences on pest activity, still, from these persistent favourable reports that are being received, it seems highly probable that this American toad has contributed in some measure towards this noticeable reduction in some of these major pests.

The *Anomola* cane beetle is so well controlled at the present time by several parasites and predators that cane grub damage was non-existent during the period of the writer's visit to Hawaii; but at the same time, if the trouble ever did become serious again, it is probable that owing to the secluded habits of the beetles prior to and during oviposition, the toad would have little chance of locating and eating them before they had time to lay their eggs. They could, therefore, not be expected to clean up every small outbreak of *Anomola* which might occur periodically in future years. However, as a very excellent parasite and predator complex, supplemented by arsenic treatment of infested soils, appears to be taking care of all *Anomola* grub infestations, *Bufo* may not be needed to assist greatly in this work.

In Puerto Rico the giant toad, through its attack on the local cane beetle (slightly smaller than our greyback cane beetle) has been signally successful in cleaning up white grub damage, and if its introduction into Queensland is followed by a control of the magnitude of that obtained in Puerto Rico, then something very tangible in white grub control will have been attained as a result of this importation. Concerning the status of the Puerto Rican white grub, and the influence of the giant toad, Wolcott has the following to say:—

"In less than ten years after its first importation into Puerto Rico the giant toad, *Bufo marinus* L., has changed the economic status of white grubs on the island from that of a major pest to one of comparative rarity. The most obvious indication of such a change is that fields of sugar-cane on the South Coast, especially in districts where grubs were

formerly most abundant, can now be successfully and profitably ratooned. When white grubs were abundant such a procedure would have been impossible; now it is the rule. Formerly the roots of sugar-cane were so completely destroyed that the stalks had to be harvested in advance of normal maturity; now they are so numerous that ploughing and replanting are obviously unnecessary. To be sure, different varieties of cane are being grown, and some other factors have been changed, but the one of importance is that white grubs are no longer present in sufficient numbers to cause appreciable injury to the cane roots. For this changed condition the imported toad is almost entirely responsible.

Parts of North Queensland are particularly well favoured with mountain streams intersecting or flowing near to canefields, whilst other parts are flatter and more swampy, and provide conditions which are comparable to either the Manoa Valley or Waipio types of country in Hawaii, so that conditions should prove suitable for the establishment of this toad which has hitherto proved so adaptable to rapid multiplication under conditions obtaining in most sugar-cane growing countries.

The greyback cane beetles, against which this toad has been primarily introduced, fly to various feeding trees soon after their emergence from the soil, and a period of approximately 14 days elapses before their eggs are sufficiently developed to be deposited in the soil. During this 14-day period the beetles alternate between the feeding trees and resting trees, but the toads do not ascend trees, so that they are not likely to exact toll from them in these positions. From information gleaned elsewhere it appears that in Puerto Rico a somewhat similar state of affairs exists, where the beetles fly nightly to feed on such trees as poincianas, casuarinas, bananas, pigeon peas, and occasionally on sugar-cane itself, returning to the soil in the early morning, and it is probable that the toads account for large numbers of beetles either when they are emerging from or returning to the soil. It would appear, therefore, that such habits are ideal from the point of view of control of the beetle by the toad, for the fact remains that these animals ultimately account for large numbers of beetles.

With regard to the greyback beetle, the same clear cut daily return of the whole beetle population to the soil does not exist. Therefore, the degree of control which we can expect through the agency of these toads will centre largely around the length of time the beetles actually spend on or near the ground either when they are emerging from or re-entering the soil, and of course around the number of times they subject themselves to this procedure of migration from soil to feeding trees and vice versa. Therefore, in direct proportion to the length of time spent by the greyback, or any other beetle pest, on or near the ground in accessible places (or, rather, in places usually frequented by the toads), so might we expect the degree of control of these pests to rise proportionately high. There seems to be little room to doubt that when these toads have reached saturation point they will greedily devour any beetles of a similar size that may come within their sphere of activities.

Wolcott, who apparently was under the impression that *Bufo marinus* had already been imported into Queensland and Fiji, has the following to say concerning these introductions in a paper read before

the Association of Sugar Cane Technologists of Puerto Rico, December, 1934:—

"If conditions in these countries are at all comparable to those in Puerto Rico, let me now predict that within ten or fifteen years the white grub problems of these countries will be solved."

Whilst all of our species of white grubs may not lend themselves to control by the giant toad, and we may not altogether entertain the same high degree of optimism as that displayed by Wolcott, still we have reason to maintain a certain amount of optimism concerning the effect that this toad is likely to have in minimising greyback grub damage in some of our Northern canefields. Whether our speculations are fully justified is one of the fascinating problems met with in economic entomology, and time alone will show whether our cherished hopes for the total elimination of grub damage in Queensland canefields will be realised.

THE COUNCIL OF AGRICULTURE.

An Order in Council has been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, declaring that the number of members of the Council of Agriculture shall be twenty-nine. This number is made up as follows:—The Secretary for Agriculture and Stock (President), the Director of Marketing, two members of the Butter Board, and one member of each of the remaining commodity boards, including the Wheat Board, the Committee of Direction of Fruit Marketing, and the Queensland Cane Growers' Council; representatives of nine districts embracing local producers' associations are also included.

A Regulation has been approved covering the members of commodity boards who shall be members of the Council of Agriculture, and these are:—

Messrs.—

J. McRobert (Maryborough)	Butter Board
W. J. Sloan (Malanda)	Butter Board
H. T. Anderson (Dalby)	Cheese Board
J. Beck (Stanwell)	Cotton Board
J. Gargan (Atherton)	Atherton Maize Board
C. Brumm (Woongoolba)	Arrowroot Board
A. G. Whiting (Atherton)	Peanut Board
R. V. Woodrow (Woodford)	Honey Board
M. Kessler (Cambooya)	Barley Board
W. T. Hughes (Middle Ridge, Toowoomba)	Egg Board
H. Niemeyer (Hatton Vale)	Broom Millet Board
G. D. O'Neill (Allora)	Canary Seed Board
D. Johnston (Malanda)	Northern Pig Board
W. Ranger (Brisbane)	Committee of Direction of Fruit Marketing
G. Johnson (Mirani, Mackay)	Queensland Cane Growers' Council.
W. J. Brimblecombe (Pirrinuen)	Wheat Board
G. A. Duffy (Brisbane)	Plywood and Veneer Board
G. A. Duffy (Brisbane)	Northern Plywood and Veneer Board

Executive approval has also been given to the appointment of the following representatives of districts embracing local producers' associations:—

Messrs.—	*District.*
R. R. Nothling (Hut Creek, via Ambrose)	No. 1—Central Queensland
V. Baker (Gayndah)	No. 2—The Burnett
W. L. Osborne (Wondai)	No. 3—South Burnett
P. Daley (Maleny)	No. 4—Wide Bay
C. Bateman (Woodford)	No. 5—East Moreton
W. A. Fielding (Blenheim)	No. 6—West Moreton
J. Buckley (Rose Hill)	No. 7—Darling Downs
W. E. Ashford (Hannaford)	No. 8—Western Downs
J. P. McCarthy (Tolga)	No. 9—Atherton Tablelands

QUEENSLAND STATISTICS.

A copy of the 1935 issue of the "A B C of Queensland and Australian Statistics" has been forwarded to us by the Registrar-General (Mr. George Porter).

This useful booklet is to all intents and purposes the Official Year Book of Queensland, and is presented under the authority of the State Government. The 1935 edition contains, in addition to the main features appearing in the 1934 issue, information relating to (*a*) Consideration of Sales, Mortgages, Bills of Sales, Liens on Crops, &c., for five years; (*b*) The names of the several Friendly Societies with their numerical strength and capital as at the 30th June, 1933; (*c*) The grades of employment and the causes of unemployment as revealed by the Census of 30th June, 1933; also the numbers belonging to the various industries; (*d*) Employment in principal industries; these figures are collected from selected groups, and the table shows the trend of employment for eighteen months ended 31st December, 1934; (*e*) Additional Tables are included showing the Value of Production in Queensland; (*f*) Postal Notes and Money Orders for Queensland for five years; (*g*) Cargo shipped and discharged at Queensland Ports for the year ended 30th June, 1934; (*h*) Information concerning the Building Revival Scheme; and (*i*) The ages and Nationalities of the population as at the Census, 30th June, 1933. Some of the tables have been remodelled to show more useful and interesting data.

Taxation provisions for all States and the Commonwealth have been revised in accordance with amending legislation; also levies for unemployment relief. Licenses payable are brought up to date, and the scale of fees payable for registration of motor vehicles has been revised.

Information concerning all phases of Production—Primary and secondary—Finance, Labour and Industrial matters, Vital Statistics, &c., is included.

Population.—The population of Queensland at the 31st December, 1934, was 959,752. The crude birth rate of 18.13 per thousand of population is the second highest in Australia, whilst the crude death rate—8.83—is the fourth lowest in Australia and fifth lowest in the world.

Trade.—The value of Oversea Imports for 1933-34 in Australian Currency was £5,821,417; and Exports, £19,617,628; the Excess of Exports being £13,796,211. The Imports and Exports per head of population were £6 2s. 6d. and £20 12s. 9d. respectively.

Finance.—The Public Debt of Queensland at 30th June, 1934, was £117,817,352—£122 19s. 8d. per capita of population. The total amount of taxation was £6 3s. per capita.

Motor and Wireless Licenses.—At the 31st December, 1934, there were 97,390 Motor Vehicles registered, and 62,722 Wireless Listeners' Licenses were in force.

Employment.—For the year 1934 Queensland's percentage of unemployment—11.7—was well below that of any other State; the figure for the Commonwealth was 20.5.

Live Stock.—At 1st January, 1934, there were 5,781,170 cattle, 20,072,804 sheep, 450,024 horses, and 217,448 pigs.

The Wool Production of 1933-34 amounted to 169,989,516 lb. (greasy), and was valued at £10,227,703.

Agriculture and Dairying.—In 1933 the Wheat Crop was 4,361,614 bushels; Maize, 3,715,764 bushels; Sugar made, 638,559 tons; Cotton (unginned), 17,718,306 lb.; Tobacco, 2,079,754 lb.; the Butter made amounted to 114,032,603 lb.

Mineral Production.—The total Mineral Production was valued at £2,103,927 for 1933, including—Coal, £693,383; Lead, £527,696; Gold (at Gold Standard Value), £390,779; Silver, £181,108; Tin, £123,620; and Copper, £105,031.

Value of Production.—The recorded production from all Queensland Industries for 1933-34 was valued at £52,551,225, or £55 5s. 8d. per capita of population, Primary providing £39 6s. per capita and Manufacturing £15 19s. 8d.

These are but a few of the interesting features of the "A B C," which is now available at a nominal cost of 2s. (posted 2s. 3d.). Copies may be had upon application at the Registrar-General's Office, Treasury Buildings, Brisbane.

Analyses of some Wheats, 1934-1935 Harvest.

By E. H. GURNEY, A.A.C.I., Agricultural Chemist.

FOR the purpose of comparing some of the commonly-grown Queensland wheats the State Wheat Board was asked to have forwarded average samples from various districts.

In this connection 152 samples were received and analysed, and the results are given below; also the district and type of soil in which the samples were grown.

It is intended to have samples from future harvests analysed in order to enable comparison to be made of the several wheats which have been grown under possibly varying seasonal conditions. For this reason it would be inadvisable to make any very definite statement concerning the specific protein quality of the various wheat samples detailed below; and, again, only one or a few samples of some of the varieties in this season's harvest have been analysed.

The analyses were made upon the whole wheat ground to pass through a 1 mm. sieve.

The figures given below, showing the area sown with the different varieties analysed, were taken from the Queensland State Wheat Board's census of the wheat varieties grown during the 1934-35 season.

Variety.	Acres.	Per cent.
Florence	46·682	16·27
C.C.C.	44·924	15·67
Flora	33·951	11·84
Gluyas	24·392	8·51
Pusa	23·388	8·15
Clarendon	21·277	7·41
Cedric	17·290	6·03
Cleveland	12·423	4·33
Currawa	8·950	3·12
Nabawa	7·648	2·67
Novo	6·491	2·26
Ford	6·436	2·24
Warren	5·091	1·77
Seaform	2·868	1·00
Amby	1·927	0·67
Duke of York	1·927	0·67
Quality	1·634	0·57
Canberra	1·034	0·36

WHEATS FROM STATE WHEAT BOARD, 1934-1935 HARVEST

Laboratory No.	District.	Variety.	Class of Soil.	Moisture.	Protein.	Protein on 10 Per Cent. Moisture.	Average Settling Time (Minutes).	Specific Protein Quality.	Bushel Weight in Lb.	Weight of 1,000 Grains in Grams.
4874	Oakey	Amby	Light black	11·2	10·4	10·5	156	14·8	62·4	37·77
4875	Ditto	ditto	ditto	11·8	10·3	10·5	131	12·5	62·7	38·30
4863	Brookstead	B.F.G.	Heavy black	11·5	13·4	13·6	149	11·0	62·5	39·90
4864	Ditto	B.F.G., B.F.G.	ditto	11·8	13·5	13·8	34	2·5	61·5	40·76
4888	Oakey	Canberra	Light black	11·4	12·0	12·2	53	4·3	60·8	43·56
4889	Ditto	ditto	ditto	11 5	12·3	12·5	37	3·0	..	..
4861	Brookstead	C.C.C.	Heavy black	10·3	13·9	13·9	123	8·9	62·8	39·23
4862	Ditto	ditto	ditto	11·0	13·4	13·6	122	9·0	63·3	39·51
4935	Dalby	ditto	ditto	11·2	12·6	12·8	120	9·4	62·9	41·74
4936	Ditto	ditto	ditto	10·4	13·0	13·1	79	6·0	63·7	40·63
4967	Nangwee	ditto	ditto	11·1	14·7	14·9	125	8·4	62·6	40·85
4984	Pittsworth	ditto	Light black	11·7	12·3	12·5	84	6·7	61·2	37·61
4985	Ditto	ditto	ditto	11·2	16·4	16·6	78	4·7	62·3	41·36
4853	Brookstead	Cedric	Heavy black	10·4	12·4	12·5	24	1·9	62·7	36·99
4854	Ditto	ditto	ditto	10·6	10·8	10·9	24	2·2	63·3	35·25
4883	Oakey	ditto	..	10·8	11·7	11·8	29	2·5	60·7	35·26
4884	Ditto	ditto	..	11·7	9·8	10·0	24	2·4	..	..
4905	Bongeen	ditto	Heavy black	10·0	14·1	14·1	30	2·1	62·1	32·09
4908	Ditto	ditto	ditto	11·6	13·9	14·2	45	3·2	62·6	33·59
4921	Perrinuan	ditto	ditto	11·3	13·2	13·4	64	4·8	62·2	37·48
4922	Ditto	ditto	ditto	10·7	12·0	12·1	25	2·1	63·3	37·75
4944	Dalby	ditto	ditto	10·5	13·4	13·5	27	2·0	61·5	38·02
4950	Ditto	ditto	ditto	10·8	12·0	12·1	33	2·7	62·1	41·02
4978	Nangwee	ditto	ditto	11·5	12·5	12·7	38	3·0	61·1	37·43
4979	Ditto	ditto	ditto	11·2	11·7	11·9	23	1·9	62·4	39·14
4987	Pittsworth	ditto	Light black	10·8	12·5	12·6	22	1·7	62·3	35·63
4991	Ditto	ditto	ditto	10·5	11·2	11·3	23	2·0	63·8	37·11
4881	Oakey	Clarendon	..	10·3	10·9	10·9	24	2·2	61·1	38·98
4882	Ditto	ditto	..	11·1	10·7	10·8	25	2·3	61·6	39·65
4859	Brookstead	ditto	Heavy black	10·7	13·4	13·5	30	2·2	63·0	42·00
4860	Ditto	ditto	ditto	11·3	13·9	14·1	38	2·7	63·2	42·65
4904	Bongeen	ditto	ditto	9·9	13·8	13·8	28	2·0	59·8	39·94
4907	Ditto	ditto	ditto	10·7	13·3	13·4	30	2·2	63·4	40·13
4957	Dalby	ditto	ditto	11·8	11·5	11·7	25	2·1	..	..
4992	Pittsworth	ditto	Light black	11·0	13·7	13·9	32	2·3	63·5	36·02
4999	Ditto	ditto	ditto	10·7	14·6	14·7	33	2·3	62·6	39·16
4876	Oakey	Cleveland	..	11·3	10·0	10·1	19	1·9	59·0	41·14
4877	Ditto	ditto	..	11·4	9·8	10·0	24	2·4	58·9	40·25
4906	Bongeen	ditto	Heavy black	10·8	12·9	13·0	29	2·2	59·6	36·52
4912	Ditto	ditto	ditto	11·8	11·6	11·8	21	1·8	59·7	43·88
4930	Perrinuan	ditto	ditto	11·3	10·2	10·3	27	2·6	..	..
4942	Dalby	ditto	ditto	11·2	11·0	11·1	25	2·3	58·2	36·05
4954	Ditto	ditto	ditto	11·8	10·8	11·0	15	1·4	56·6	35·17

WHEATS FROM STATE WHEAT BOARD, 1934-1935 HARVEST—*continued.*

Laboratory No.	District.	Variety.	Class of Soil.	Moisture.	Protein.	Protein on 10 Per Cent. Moisture.	Average Settling Time (Minutes).	Specific Protein Quality.	Bushel Weight in Lb.	Weight of 1,000 Grains in Grams.
4990	Pittsworth	Cleveland	Light black	10·8	11·7	11·8	21	1·8	59·7	40·14
5000	Ditto	Club	ditto	11·1	12·5	12·7	26	2·1	63·6	33·09
5003	Ditto	ditto	ditto	10·6	12·3	12·4	23	1·9	63·4	32·56
4869	Oakey	Currawa	Sandy	11·7	11·2	11·4	42	3·7	..	..
4870	Ditto	ditto	..	11·5	9·9	10·1	36	3·6	58·1	39·84
4871	Brookstead	ditto	Heavy black	10·5	12·6	12·7	35	2·8	58·8	40·10
4909	Bongeen	ditto	ditto	11·0	13·7	13·9	43	3·1	59·7	46·85
4916	Ditto	ditto	ditto	11·2	13·5	13·7	25	1·8	59·1	44·06
4934	Dalby	ditto	Light black	11·6	10·3	10·5	43	4·1	60·1	50·76
4963	Nangwee	ditto	Heavy black	10·7	10·9	11·0	33	3·0	60·0	47·44
4969	Ditto	ditto	ditto	11·4	11·5	11·7	37	3·2	55·6	43·27
4994	Pittsworth	ditto	Light black	10·6	12·8	12·9	31	2·4	63·8	50·99
4997	Ditto	ditto	ditto	10·9	12·1	12·2	28	2·3	59·0	44·00
4900	Bongeen	Duke of York	Heavy black	11·6	13·1	13·3	40	3·0	63·0	44·36
4910	Ditto	ditto	ditto	11·5	14·0	14·2	33	2·3	62·3	43·42
4945	Dalby	ditto	Light black	10·7	11·3	11·4	27	2·4	61·9	47·13
4965	Nangwee	ditto	Heavy black	10·9	12·4	12·5	42	3·4	61·7	39·85
4976	Ditto	ditto	ditto	11·2	12·9	13·1	37	2·8	61·7	39·78
4948	Dalby	Durac	ditto	10·8	12·3	12·4	37	3·0	..	..
4949	Ditto	ditto	ditto	11·2	13·0	13·2	24	1·8	50·7	31·86
4893	Oakey	Flora	Sandy	11·2	10·6	10·7	48	4·5	62·7	35·24
4894	Ditto	ditto	ditto	11·7	12·3	12·5	40	3·2	61·3	33·48
4895	Bongeen	ditto	Heavy black	10·8	14·1	14·2	48	3·4	63·9	37·67
4914	Ditto	ditto	ditto	11·5	13·0	13·3	52	3·9	60·3	32·11
4920	Perrinuan	ditto	ditto	11·0	12·3	12·4	84	6·8	..	38·96
4932	Ditto	ditto	ditto	10·8	12·5	12·6	69	5·5	62·2	35·97
4940	Dalby	ditto	ditto	10·9	12·3	12·4	84	6·8	63·7	36·00
4951	Ditto	ditto	ditto	10·7	12·5	12·6	85	6·8	62·7	35·21
4973	Nangwee	ditto	ditto	10·9	12·6	12·7	48	3·8	64·7	36·71
4986	Pittsworth	ditto	Light black	11·1	11·9	12·0	18	1·5	64·0	38·67
4961	Nangwee	ditto	Heavy black	10·9	13·2	13·3	32	2·4	64·3	37·07
4995	Pittsworth	ditto	Light black	11·1	13·4	13·6	22	1·6	64·5	35·77
4872	Oakey	Florence	Sandy	11·3	13·0	13·2	52	3·9	62·9	43·04
4873	Ditto	ditto	ditto	11·4	12·8	13·0	57	4·4	61·6	40·79
4898	Bongeen	ditto	Heavy black	10·6	15·3	15·4	47	3·1	63·2	39·83
4913	Ditto	ditto	ditto	11·6	15·4	15·7	44	2·8	63·7	39·91
4929	Perrinuan	ditto	ditto	11·9	12·7	13·0	91	7·0	61·9	41·24
4931	Ditto	ditto	ditto	11·3	12·9	13·1	101	7·7	62·9	49·02
4941	Dalby	ditto	ditto	10·8	12·9	13·0	44	3·4	63·2	42·45
4952	Ditto	ditto	ditto	11·0	13·0	13·1	91	6·9	62·3	42·59
4959	Nangwee	ditto	ditto	11·0	12·4	12·5	73	5·8	61·6	42·04
4971	Ditto	ditto	ditto	11·2	12·2	12·4	74	6·0	62·2	44·89
4982	Pittsworth	ditto	Light black	10·5	15·2	15·3	45	2·9	62·8	38·87
4988	Ditto	ditto	ditto	10·9	15·9	16·1	40	2·5	61·8	39·33

4857	Brookstead	Ford	Heavy black	10·7	11·0	11·1	56	5·0	62·9	43·04
4858	Ditto	ditto	ditto	10·4	12·0	12·1	70	5·8	62·5	41·14
4915	Bongeen	ditto	ditto	11·4	12·8	13·0	83	6·4	62·6	43·12
4917	Ditto	ditto	ditto	11·0	13·6	13·8	94	6·8	61·6	39·79
4946	Dalby	ditto	Light black	11·1	10·9	11·0	26	2·4	59·1	40·70
4947	Ditto	ditto	ditto	11·1	10·7	10·8	31	2·9	59·9	44·44
4977	Nangwee	ditto	Heavy black	11·3	10·9	11·1	79	7·1	61·2	45·44
4980	Ditto	ditto	ditto	11·3	11·3	11·5	73	6·4	60·4	44·54
5001	Pittsworth	ditto	Light black	11·7	13·4	13·7	79	5·8	63·4	41·01
5002	Ditto	ditto	ditto	11·3	13·0	13·2	75	5·7	63·3	40·91
4890	Oakey	Gluyas	ditto	11·3	10·6	10·8	24	2·2	60·8	43·91
4891	Ditto	ditto	ditto	11·0	11·7	11·8	36	3·1	61·6	43·50
4892	Ditto	ditto	..	10·6	10·2	10·3	34	3·3	61·0	45·60
4897	Bongeen	ditto	Heavy black	11·2	12·8	13·0	32	2·5	61·6	42·58
4911	Ditto	ditto	ditto	10·5	13·3	13·4	27	2·0	61·8	41·62
4964	Nangwee	ditto	ditto	11·5	12·3	12·5	25	2·0	59·6	40·23
4974	Ditto	ditto	ditto	11·2	13·4	13·6	34	2·5	61·7	44·96
4993	Pittsworth	ditto	Light black	11·9	10·1	10·3	21	2·0	61·4	43·17
4996	Ditto	ditto	ditto	11·4	10·8	11·0	23	2·1	60·9	41·40
4867	Oakey	Nabawa	..	11·7	13·9	14·2	36	2·5	59·1	40·91
4868	Ditto	ditto	..	10·2	14·5	14·5	30	2·1	58·7	41·61
4896	Bongeen	ditto	Heavy black	10·9	13·0	13·1	41	3·1	61·5	45·94
4918	Ditto	ditto	ditto	11·0	12·3	12·4	63	5·1	60·8	45·37
4924	Perrinuan	ditto	ditto	11·0	10·2	10·3	29	2·8	59·3	46·27
4960	Nangwee	ditto	ditto	11·4	12·7	12·9	28	2·2	..	46·53
4966	Ditto	ditto	..	11·2	12·3	12·5	29	2·3	..	42·26
5004	Pittsworth	ditto	Light black	10·9	12·3	12·4	33	2·7	59·7	38·82
5005	Ditto	ditto	ditto	11·4	12·3	12·5	30	2·4	60·1	38·77
4927	Perrinuan	Novo	Heavy black	10·9	11·4	11·5	25	2·2	61·7	32·96
4928	Ditto	ditto	ditto	11·8	11·1	11·3	75	6·6	..	35·52
4943	Dalby	ditto	ditto	10·9	10·3	10·4	20	1·9	60·7	33·43
4956	Ditto	ditto	ditto	10·6	10·7	10·8	18	1·7	62·6	31·93
4937	Ditto	Pinto	ditto	11·8	12·5	12·7	65	5·1	63·0	44·13
4953	Ditto	ditto	ditto	10·8	11·6	11·7	55	4·7	62·6	44·50
4885	Oakey	Pusa	Light black	11·4	14·2	14·4	166	11·5	63·8	38·06
4886	Ditto	ditto	..	11·3	11·4	11·6	134	11·6	63·6	37·28
4887	Ditto	ditto	..	11·9	15·1	15·4	159	10·3	..	..
4919	Bongeen	ditto	Heavy black	11·0	13·7	13·9	150	10·8	60·3	37·50
4925	Perrinuan	ditto	ditto	11·6	11·6	11·8	137	11·6	63·6	39·17
4933	Ditto	ditto	ditto	11·0	11·6	11·7	101	8·6	63·1	39·84
4938	Dalby	ditto	ditto	11·7	12·7	12·9	155	12·0	63·2	40·75
4958	Ditto	ditto	ditto	10·3	12·1	12·1	137	11·4	62·5	39·43
4962	Nangwee	ditto	ditto	10·9	11·6	11·7	132	11·3	63·5	37·95
4972	Ditto	ditto	ditto	10·5	14·1	14·2	163	11·5	63·7	41·60
4983	Pittsworth	ditto	Light black	10·2	13·9	13·9	155	11·2	63·0	38·44
4998	Ditto	ditto	ditto	10·5	14·0	14·1	174	12·4	62·9	38·87
4865	Brookstead	Quality	Heavy black	11·8	13·0	13·3	103	7·8	63·4	41·29
4866	Ditto	Roma red	ditto	11·7	10·7	10·9	25	2·3	..	..
4939	Dalby	ditto	Light black	10·7	13·9	14·0	26	1·9	61·6	38·04
4955	Ditto	ditto	Heavy black	11·9	13·5	13·8	20	1·5	58·8	37·66
4968	Nangwee	ditto	ditto	11·3	10·4	10·6	23	2·2	61·2	40·56
4981	Ditto	ditto	ditto	11·5	10·9	11·1	29	2·6	62·1	41·37

WHEATS FROM STATE WHEAT BOARD, 1934-1935 HARVEST—*continued.*

Laboratory No.	District.	Variety.	Class of Soil.	Moisture.	Protein.	Protein on 10 Per Cent. Moisture.	Average Settling Time (Minutes).	Specific Protein Quality.	Bushel Weight in Lb.	Weight of 1,000 Grains in Grams.
4899	Bongeen	Sea foam	Heavy Black	11·6	15·3	15·6	105	6·7	59·8	38·98
4923	Perrinuan	ditto	ditto	11·5	12·3	12·5	92	7·4	62·8	43·19
4926	Ditto	ditto	ditto	11·4	13·0	13·2	140	10·6	62·3	39·37
4989	Pittsworth	ditto	Light black	11·1	12·6	12·8	115	9·0	62·7	36·98
5006	Ditto	ditto	ditto	11·0	12·4	12·5	119	9·5	61·8	37·62
4855	Brookstead	Warren	Heavy black	10·0	11·6	11·6	80	6·9	60·2	39·58
4856	Ditto	ditto	ditto	9·9	11·9	11·9	69	5·8	59·8	37·94
4878	Oakey	ditto	Sandy	11·3	10·9	11·1	65	5·9	60·8	42·51
4879	Ditto	ditto	ditto	11·9	11·3	11·5	83	7·2	58·5	35·43
4880	Ditto	ditto	ditto	11·7	11·5	11·7	86	7·4	60·8	41·37
4970	Nangwee	ditto	Heavy black	10·8	11·6	11·7	97	8·3	58·7	41·60
4975	Ditto	ditto	ditto	11·2	11·3	11·5	81	7·0	58·2	41·91

A New Quarantine House.

By A. F. BELL.*

On this page we reproduce a photograph of a new insect-proof glass house which has been constructed in Brisbane for the reception of new cane varieties imported by the Bureau from overseas. This house has been designed in accordance with modern quarantine requirements and will be put into commission during August, when five new varieties will be received.

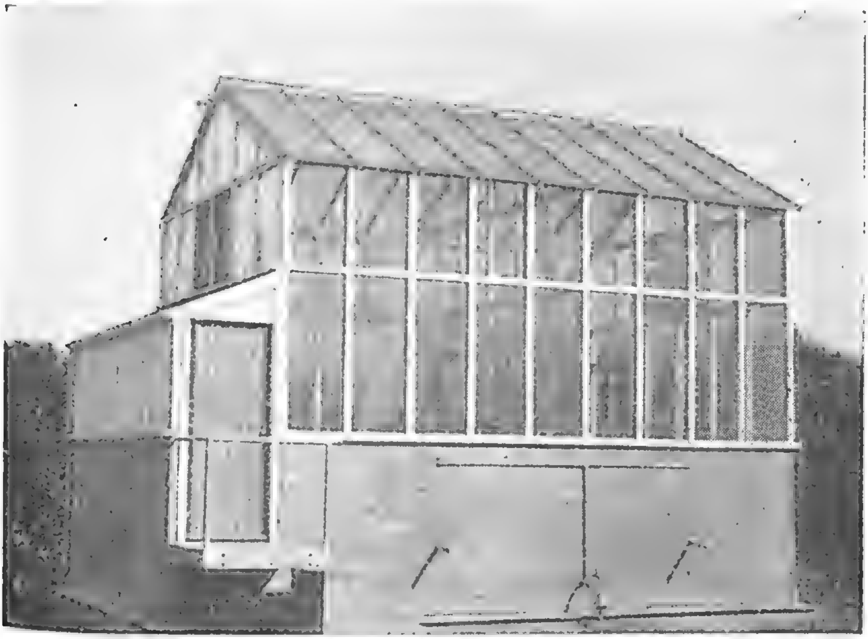


Plate 89.—Quarantine-House Recently Completed in Brisbane.

The structure is of reinforced concrete, with the superstructure composed of glass, which is reinforced for protection against hail-storm damage. Ventilation is provided by panels in which copper gauze is substituted for glass; on the far side of the house, and at either end, the gauze is set within hinged glass doors so that the draught can be regulated. In summer, to prevent excessive temperatures, canvas blinds can be drawn across the underside of the roof. Entrance is gained through a double closed compartment, one half of which is painted black inside and is completely dark when closed. The object of this is to reduce the probability of insects flying into or from the house when a person is passing in or out. The floor of the house is some 4 feet above ground level and is reached by steps which do not make contact with the main structure, thus preventing the ingress of ants. In addition, the main structure is surrounded by a gutter, let into the concrete, which is filled with water; sticks and leaves which would act as rafts for ants are kept out by a small sheet iron awning.

The interior of the house is divided into two sections, the larger of which will carry six stools of cane and the smaller four stools. The cane is grown in sections of concrete piping 2 feet in diameter and 2 feet

* In the "Cane Growers' Quarterly Bulletin" for July (Bureau of Sugar Experiment Stations).

6 inches high, and can be grown to maturity without difficulty. The soil in which the setts are planted is sterilized before being placed in the tubs.

Upon being received from overseas the material in which the cane has been packed is destroyed, and the cane is sterilized in corrosive sublimate to kill any fungus spores which may be attached to the surface. The setts are then treated in warm water at 125 deg. Fahrenheit for a period of 20 minutes before being planted; the value of the warm water treatment is three-fold; it stimulates germination of the setts, it cures certain diseases, and it destroys insect eggs which may have been deposited in the cane.

For the purpose of the despatch of cane setts from one country to another they are packed in powdered charcoal to which has been added about 10 per cent. of water, plus a little formalin, to prevent the growth of moulds. This amount of moisture is sufficient to prevent the setts from drying out when placed in a sealed container; but is not sufficient to encourage germination. As a further protection the freshly-cut ends of the setts are pitched before packing.

It is at times argued that, since Queensland is cursed with the presence of nearly all the important diseases of sugar cane, elaborate precautions are unnecessary when introducing new varieties. However, modern investigation has shown that this is a fallacious argument because in very many diseases there exist so-called "strains" of the "germs" which cause the disease. For example, there are at least a couple of dozen strains of the fungus which causes wheat rust and a particular variety of wheat may be susceptible to only three or four of these strains. As only a fraction of these strains are usually present in any one locality it will be seen that a variety which is considered to be resistant to rust in one area might prove very susceptible to a strain present in another area. In the case of the well-known mosaic disease of sugar-cane it has recently been found that there are at least three strains of this disease present in the United States. Furthermore, varieties which are resistant to one strain have been found to be susceptible to one or both of the others. Very probably we do not have these three strains in Queensland, therefore, it will be appreciated that although they have mosaic disease in the United States, and we have mosaic disease in this State, it may not be quite the same; and careless handling of imported setts may introduce a mosaic disease which would attack our most important varieties. It is obvious, therefore, that great care will always have to be exercised in the importation of new varieties, and a quarantine house such as the one illustrated will greatly assist us in maintaining adequate safeguards.

Sale of Seeds.

REGULATORY LEGISLATION.

Definition of Vendor.

A vendor under the Pure Seeds Acts is any person who sells or offers or exposes for sale or contracts or agrees to sell or deliver any seeds.

Invoice to be Given by Vendor.

The Acts require that on the sale of any such seed of not less than 1s. in value, the vendor shall at the time of the sale give to the buyer, or, if the buyer is not present at the time of sale, forward to him an invoice containing the statements required by the Acts.

The wording of the invoice should be to the following effect:—

> "The seeds mentioned in this invoice are for planting or sowing. Such seeds are of the kind or kinds specified, and contain no greater proportion or amount of foreign ingredients than is prescribed with respect to such seeds."

Seeds Sold in Made-up Packets to have Year of Growing Marked.

In the case of seeds in pictorial or other made-up packets, the year in which such seeds were grown must be clearly and indelibly marked upon the outside of each packet.

Definition of Foreign Ingredients.

"Foreign ingredients" shall include inert matter, seeds of weeds, and seeds of any kind other than the seeds in question; or dead, diseased, insect-infested, non-germinable, or hard seeds.

"Inert matter"—Broken seeds less in size than one-half of a complete seed; or chaff, dust, stones, or any material other than seeds.

"Hard seeds"—Any seeds whose seed coats are so impervious to water as to delay germination.

Prohibited Seeds.

The following seeds are totally prohibited:—Seeds of *Cuscuta* spp. (Dodder), *Datura* spp. (Thorn Apple), *Ricinus communis* (Castor Oil plant), and diseased or insect-infested seeds.

Quantity of Foreign Ingredients Allowed.

The quantity of foreign ingredients allowed in the various kinds of seeds is set out in the Regulations, a copy of which can be obtained on application to the Department of Agriculture, Brisbane.

Efficient Seed-cleaning Machinery.

The Regulations do not apply to—

Seeds sold by the actual grower direct to any vendor in possession of one or more efficient cleaning machines, for the purpose of the seeds being cleaned and graded before being offered for sale as seed for sowing.

Samples from Bulk in Sender's Possession.

The Regulations provide for the examination of samples at the Seed Laboratory, Brisbane, the cost being a nominal one of 2s. 6d. for

each Certificate of Analysis. When sending such samples, it is of the utmost importance that they be drawn by the sender from seeds in his actual possession, care being taken to make them truly representative of the bulk.

To enable this to be done satisfactorily they should be drawn alternatively from the top, middle, and bottom of the bags, the proportion of bags to be sampled being as follows:—

1 to 20 bag lots—Sample should be drawn from every bag.

21 to 40 bag lots—Sample should be drawn from not less than 21 bags.

41 to 60 bag lots—Sample should be drawn from not less than 28 bags.

61 to 80 bag lots—Sample should be drawn from not less than 32 bags.

81 to 100 bag lots—Sample should be drawn from not less than 36 bags.

100 to 200 bag lots—Sample should be drawn from not less than 40 bags.

200 bags and over—Sample should be drawn from not less than 20 per cent.

If, when drawing samples, it is observed that great variation occurs in the bulk, two or more samples should be obtained, each representing bags whose contents are similar.

After the sample has been drawn as above indicated it should be emptied out on to a large piece of paper, thoroughly mixed, and then a quantity not less than the prescribed weight for such samples should be drawn for purposes of forwarding to the Seed Laboratory. A duplicate sample should be kept for reference.

In the Seed Laboratory, great pains are taken to ensure absolute accuracy of work. It, therefore, follows that all this care is wasted unless the person forwarding samples for examination takes some trouble to ensure that the samples drawn truly represent the bulks from which they are obtained. The minimum weight of each sample and the particulars to be marked on same are as hereunder set out:—

Weight of Samples.

PRESCRIBED WEIGHT OF SAMPLES.

Kind of Seed.	Weight Required.
In the case of seeds containing weed seeds or other foreign ingredients, not less than double the weight mentioned should be sent.	
Mauritius Beans, Peanuts	2 lb.
Barley, Beans, Cowpeas, Maize, Oats, Peas, Rice, Rye, Tares, Wheat ..	1 lb.
Canary, French Millet, Japanese Millet, Linseed, Lucerne, Prairie Grass, *Setaria Italica* (Foxtail Millet), *Sorghum Sudanese* (Sudan Grass), Sorghum, White Panicum	4 oz.
Paspalum dilatatum, Rhodes (*Chloris gayana*), Rye Grass, *Phalaris tuberosa*, Cocksfoot, Couch, *Panicum antidotale*, Mollasses Grass, &c.	3 oz.
Beet, Cabbage, Carrot, Onion, Parsnip, Radish, Tomato, Turnip, and Vegetable Seeds of like size	½ oz.
Vegetable Seeds in made-up packets	5 pkts.
Agricultueal and Vegetable Seeds other than those indicated above ..	2 oz.

Marking of Samples.

All samples must be plainly written on in ink, setting out the undermentioned particulars:—

(1) Name under which the seed was purchased, or is proposed to be sold;
(2) The number of bags from which the sample was drawn, and the number of bags in the whole consignment;
(3) The marks of identification, if any, on such bags;
(4) The name and address of the sender, with date of sampling;
(5) If the sender is not the actual grower, the name and address of the sender's supplier, with date of delivery.

Samples should be addressed as follows:—

Seed Sample for Examination.
Officer in Charge,
Seed Laboratory,
Department of Agriculture,
William Street,
Brisbane.

Special care should be taken to securely fasten up the sample. The examination of samples that have been opened in transit is useless for any determination, as only a sample received intact can be taken as representing any bulk.

Fee of 2s. 6d.

A covering letter, enclosing the prescribed fee of 2s. 6d. per sample, should be addressed to the Under Secretary, Department of Agriculture, Brisbane.

Free Examination.

The Seed Laboratory at Brisbane examines, free of charge, all samples representing seeds that farmers have purchased for their own sowing.

Complaints.

In case of any complaints regarding purity or germination the buyer should at once send a sample of the seed, marked with the particulars as above set out, together with a covering letter to the Department advising of the despatch of the sample; this will be examined free of charge.

Certificates.

Unless the sender is careful to forward a truly representative sample, the report thereon is valueless. Under no circumstances is a certificate or report a guarantee by the Department of Agriculture as to the bulk, but a statement as to the condition of the sample at the time when such sample was examined.

Examine Goods on the Day of Delivery.

Both buyers and sellers are urged to examine all goods on the day of delivery, and when in doubt regarding any seeds, fertilizers, pest destroyers, stock foods, or veterinary medicines, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be at once investigated.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of June, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Oakvilla Shamrock 6th (365 days)	W. G. Marquardt, Wondai	16,048·67	657·09	Victorious of Oakvilla
Jean 4th of Oakvilla	W. G. Marquardt, Wondai	14,180·74	560·692	Victory of Greyleigh
Dot 5th of Oakvilla (272 days)	W. G. Marquardt, Wondai	13,648·6	545·696	Victory of Greyleigh
Princess 6th of Oakvilla	W. G. Marquardt, Wondai	14,293·40	538·0	Victory of Greyleigh
Oakvilla Champion 7th (268 days)	W. G. Marquardt, Wondai	13,753·24	537·02	Victory of Greyleigh
Champion 4th of Oakvilla	W. G. Marquardt, Wondai	13,377·73	528·851	Victorious of Oakvilla
Rosebud 5th of Oakvilla	W. G. Marquardt, Wondai	13,269·34	524·811	Victory of Oakvilla
Snowdrop II. of Blacklands (272 days)	A. M. Johnson, Gracemere	11,794·1	479·110	Premier of Hillview
Champion 9th of Oakvilla (270 days)	W. G. Marquardt, Wondai	12,268·61	471·608	Victory of Greyleigh
Wunulla Daisy III.	A. M. Johnson, Gracemere	11,189·2	462·461	Rosebuds Success
Rosebud 7th of Oakvilla (216 days)	W. G. Marquardt, Wondai	11,022·62	447·128	Victory of Greyleigh
Melba of Minto Vale	E. O. Althouse, Cloyna	10,278·46	429·803	Sir James of Oakvale
Springleigh Beaudetta's Pearl	Moller Brothers, Boonah	11,279·75	426·918	17th Red Knight of the Cedars
Empress 11th of Sunnyside	P. Moore, Wooroolin	9,699·85	407·918	Emblem of Sunnyside
Wunulla Ultimate	A. M. Johnson, Gracemere	10,017·35	399·291	Rays Togo of Wunulla
Avonel Dream Girl	R. Scott, Toogoolawah	8,095·75	374·222	Madams President of Avonel
Sunnymeade Fairy 2nd	E. O. Althouse, Cloyna	10,188·03	368·254	Masterpiece of Oakdale
Homelea Maggie 3rd (270 days)	G. D. Lindenmayer, Mundubbera	10,689·5	361·150	Emperor of White Park

Junior, 4 Years (under 4½ Years), Standard 310 Lb.				
Wandegong Joyce 3rd	*G. D. Lindenmayer, Mundubbera*	12,642·5	455·026	Emperor of Spurfield
Rocklyn Celia	T. Strain, Wondai	10,132·67	419·113	King of Sunnyside
Waverley Sadie	R. Scott, Toogoolawah	8,877·56	354·351	Skipper of Waverley
Senior, 3 Years (over 3½ Years), Standard 290 Lb.				
Trevor Hill Starlight	G. Gwynne, Umbiram	11,606·48	505·845	Gambol of Wilga Vale
Wandegong Marjorie	G. D. Lindenmayer, Mundubbera	10,283·25	339·857	Emperor of Spurfield
Waverley Venus	R. Scott, Toogoolawah	7,879·6	315·221	Skipper of Waverley
Junior, 3 Years (under 3½ Years), Standard 270 Lb.				
Rocklyn Kate 3rd	T. Strain, Wondai	8,511·26	421·465	King of Sunnyside
Homelea Bessie	J. Savage, Humphrey	8,742·4	336·453	Emperor of Springdale
Springlands Shamrock II. (224 days)	W. G. Marquardt, Wondai	8,924·36	335·465	Boss of Hillview
Stirling Crescent	J. W. Crabb, Woodstock	6,371·25	284·294	Finance of Blacklands
Senior, 2 Years (over 2½ Years), Standard 250 Lb.				
Stirling Flora	J. W. Crabb, Woodstock	9,219·44	376·702	Defender's Boy of Orchard's Dairy
Mirth IV. of Blacklands (272 days)	A. M. Johnson, Gracemere	7,905·3	341·938	Orama of Blacklands
College Pidgeon 3rd	Queensland Agricultural High School and College, Gatton	7,502·18	315·645	Duplex of Greyleigh
Homelea Joan	J. Savage, Humphrey	6,982·5	264·265	Expert of Springdale
Nina 16th of Morden	Dobson Brothers, Camp Mountain	6,220·64	252·451	Jupiter of Morden
Junior, 2 Years (under 2½ Years), Standard 230 Lb.				
Springlands Gold	T. Strain, Wondai	7,861·95	348·377	The Hill Hollywood
Euroa Lauretta	H. T. Lindenmayer, Mundubbera	8,900·5	346·555	Emperor of Spurfield
Empress 3rd of Homelea	J. Savage, Humphrey	7,880·5	313·346	Expert of Springdale
Morden Tulip 9th	R. Mears, Toogoolawah	7,239·1	312·998	Jupiter 7th of Morden
College Diana	Queensland Agricultural High School and College, Gatton	6,088·49	259·027	Duplex of Greyleigh
Wandegong Peggy O'Neill (246 days)	G. D. Lindenmayer, Mundubbera	6,605	250·981	Emperor of Spurfield
Marn Leona	R. Martin, Biggenden	5,468·4	243·494	Glenlee Victory

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
FRIESIAN.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Towerlton Zara	F. C. Noller, Kumbia	15,682·68	587·243	Domino Belted King
Inavale Fanny 5th	A. O. Stumer, Boonah	10,987·5	394·735	Anama Drikjis Pride
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Ryfield Dairymaid 6th	F. C. Noller, Kumbia	7,137·2	250·811	St. Athens Argus
GUERNSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Moongi Cherry Plum 3rd	S. Buck, Millaa Millaa	10,043	501·034	Moongi Slyph's Show Boy
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Auchen Eden Rosebud (272 days)	J. N. Scott, Camp Mountain	7,239·9	290·912	Benbecula Majestic
JERSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Lyndhurst Molly (362 days)	J. B. Keys, Gowrie Little Plains	16,310·65	755·19	Noble King of Ogilvie
Trinity Devotion	F. P. Fowler and Sons, Coalstoun Lakes	7,815·5	505·945	Trinity Governor
Lady III. of Hillview (271 days)	A. Geritz, Oakfield	8,743·76	432·172	Playlad of Hillview
Inasfayl Masters Queen II.	McGeehan Brothers, Kairi	8,896·9	429·677	Werribee Starbrights Masterpiece II.
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Joybelle of Hillview	A. Geritz, Oakfield	6,910·28	381·06	Mike of Hillview
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Greenstock Buttercup	J. B. Keys, Gowrie Little Plains	7,573·41	428·184	Carnation Larks Baron
Wyreene Petsy	J. B. Keys, Gowrie Little Plains	7,934·2	378·808	Lyndhurst Victor
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Trecarne Lockettete 3rd	J. Schull, Oakey	5,063·55	295·244	Trecarne Golden King
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Brooklands Forward Rosebud	W. S. Conochie, Sherwood	9,420·8	451·7	Forward of Brooklands
Fauvic Double Joy	H. Cochrane, Kin Kin	5,059·2	279·102	Condong Double Promethus

	Junior, 2 Years (under 2½ Years), Standard 230 Lb.			
Woodside Volunteers Countess (365 days)	*J. and R. Williams, Crawford*	11,071·65	534·309	Rochettes Volunteer
Narcissus of Calton	J. Collins, Tingoora	9,060·1	433·841	Retford Meteor
Trinity Spotted Lily	J. Sinnamon and Sons, Moggill	7,214·92	432·432	Some Hope
Foxglove of Calton	A. Geritz, Oakfield	7,210·06	365·515	Prince Clair of Calton
Trinity Royal Lily	J. Sinnamon and Sons, Moggill	6,295·28	346·396	Some Hope
Wyreene Gentle Lady II.	J. B. Keys, Gowrie Little Plains	5,794·75	297·213	Milkman of Wyreene
Bellgarth Bequet	R. A. Slaughter, Clifton	5,063·39	290·014	Bellfaire Blondes Bellringer
Inasfayl Royal Larkspur	McGeehan Brothers, Kairi	4,831·7	257·253	Oxford Royal Renown
Waltham Farm Rose	McGregor Brothers, Yalargun	4,438·64	255·42	Trecarne Reminder
Wyreene Cherry Leaf 2nd	J. B. Keys, Gowrie Little Plains	4,499·09	254·761	Lyndhurst Majesty
Fauvic Double Gay	H. Cochrane, Kin Kin	4,688·35	244·341	Condong Double Prometheus
Wyreene Trixie 2nd	McGregor Brothers, Yalargun	3,998·69	230·33	Prospectors Goldfinder of Morago

Answers to Correspondents.

Dairy Cattle Improvement Act—Its Benefit to Producers.

A Murgon correspondent has asked what benefits are derived by producers from their contributions to the Dairy Cattle Improvement Fund; and what benefits are expected to accrue in the near future under the operation of the Dairy Cattle Improvement Act. Following is the reply:—

The benefits accruing to the producers as a result of the operations of the Dairy Cattle Improvement Act are real. The services of four fully qualified veterinary surgeons are available to dairy farmers. These officers are stationed at centres where they are within close call of the principal dairying districts. Provision is made also for the granting of a rebate of the freight, payable to the Queensland Railways, to the purchaser of an approved bull whose dam has passed the standard set down for her age for entry into the advanced register of the various herd books. It is gratifying to note that this is being taken advantage of by an increasing number of dairymen, and it is expected that this will prove an important factor in raising the standard of the dairy herds of the State. The facilities offered under the Grade Herd-testing Scheme have been extended. A better and more efficient service is now available to those dairy farmers who prefer to know, rather than guess, the value of the individual members of their herds. In every other State or country in the world where this service is rendered, varying sums up to 6s. per cow are charged, but in Queensland any farmer availing himself of the scheme does not place himself under any financial obligation. Under the Dairy Cattle Improvement Act, an educational programme has been launched for the benefit of dairy farmers, and those districts which have availed themselves of the facilities offered now enjoy the advantages of a greater knowledge of, and a broader outlook on, their business. Educational courses at the Department of Agriculture and Stock and the Animal Health Station, Yeerongpilly, for the leaders of Dairy Committees have been well attended, and the knowledge gained is being disseminated among the many farmer throughout the districts represented. These educational facilities have been extended to the field, right to every dairying centre, by means of periodical field days. Many of these field days have already been held, and a further programme is now being arranged. The field day consists of lectures and demonstrations by Departmental experts on veterinary science and dairy bacteriology and economics. The popularity of the field day is ample evidence that these services are appreciated by the dairying communities, and shows clearly that the dairy farmer is anxious to acquire a fuller knowledge of the fundamental principles of his calling. Under the Dairy Cattle Improvement Act the acquisition of this knowledge is made possible. As an adjunct to these activities, a modern dairy laboratory, fully equipped and staffed with experienced scientists, will be opened shortly. In the laboratory many problems affecting the welfare of the dairying industry will be studied and investigated. A general improvement in dairy production must result from all these activities.

"Cattle Bush."

E.C. (Texas, Q.)—

The specimen represents *Pittosporum phillyræoides,* sometimes called "native willow," or the "willow pittosporum." It is a native of Queensland, New South Wales, and parts of South Australia, so you will see it is fairly widely distributed. We have seen it in a number of localities, mostly just a few trees, and nowhere in abundance. The plant is not known to possess any poisonous or harmful properties; in fact, the leaves are said to make excellent cattle feed during a dry spell, and "Cattle Bush" is a local name we have heard applied to it.

Mitchell Grass on the Coast.

R.A.W. (Rosedale).

Your specimen represents a variety of Mitchell grass generally known as the Bull Mitchell, *Astrebla squarrosa,* a very common species in parts of the north-west. It is a valuable fodder plant, and not likely to become a nuisance in any way. It would be interesting to see how it does on the coast.

General Notes.

Staff Changes and Appointments.

Mr. F. D. Marshall (Monogorilby, via Mundubbera), a qualified candidate from the recent examination for Stock, Slaughtering, and Dairy Inspectors, has been appointed an Inspector under the Dairy Produce Acts, the Diseases in Stock Acts, and the Slaughtering Act, Department of Agriculture and Stock.

Mr. G. R. Blair, Acting Secretary of the Australian Sugar Co. Pty., Ltd., Mourilyan, has been appointed Millowners' Representative on the Mourilyan Local Sugar Cane Prices Board, in lieu of Mr. D. G. McLeod, resigned.

Honorary Rangers appointed under the Animals and Birds Acts are:—Messrs. R. M. Foote (Ipswich), T. L. Moon and C. C. Moon (Blenheim, via Laidley), H. H. Rowan (Superintendent, Lockhart River Mission), W. F. McKenzie (Superintendent, Aurukun Mission), S. E. McKay (Superintendent, Weipa Mission), and R. McLelland (Superintendent, Mapoon Mission).

Mr. F. Round, Stock, Slaughtering, and Dairy Inspector, has been transferred from Toowoomba to Pittsworth.

The undermentioned have been appointed Honorary Rangers under the Animals and Birds Acts:—

Messrs. C. W. J. Bedford, junior, Fernleigh Dairy, North Side, Mackay; G. H. Harris, Fairney View; J. E. Summerville, Borallon; C. Bell, J. B. Thornton, T. E. Thornton, W. C. Bell, and W. Fallon, Post Office, Ipswich; P. W. Powell and F. W. Findlay, Mount Crosby; C. H. Summerville, Post Office, Tivoli; J. F. Smith, Post Office, North Ipswich; E. McG. Thornton, Post Office, Ipswich.

Constable M. A. Bergin, Canungra, has been appointed also Slaughtering Inspector.

Mr. F. B. Coleman, Inspector and Examiner under the Fertilisers Act, the Pure Seeds Act, and the Stock Foods Act, Department of Agriculture and Stock, has been appointed Officer-in-Charge, Seeds, Fertilizers, Veterinary Medicines, and Stock Foods Investigation Branch, Department of Agriculture and Stock.

Mr. F. Keogh, who is at present seconded to the Agricultural Chemical Laboratory, has been appointed Analyst, Agricultural Chemical Laboratory, Department of Agriculture and Stock.

The designation of the position of Supervisor of Dairying has been changed to that of Director of Dairying, and Mr. G. H. E. Heers, Supervisor of Dairying, has been appointed Director of Dairying, Department of Agriculture and Stock.

Mr. T. G. Graham, who is at present seconded to the Department of Agriculture and Stock as Instructor in Agriculture, has been appointed Instructor in Agriculture, Department of Agriculture and Stock. Mr. Graham is at present stationed at Mareeba.

Honorary Rangers appointed in pursuance of the provisions of the Animals and Birds Acts and the Native Plants Protection Act include a number of officers of the Forestry Sub-Department, and also Mr. H. E. Young, Assistant to Pathologist, Department of Agriculture and Stock.

Mr. R. M. Cunningham, of Mourilyan, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. R. J. O'Sullivan, Inspector of Stock, Slaughtering, and Dairies, has been transferred from the Bacon Factory, Doboy, to Maryvale.

Mr. F. B. Coleman, Officer in Charge, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch, Department of Agriculture and Stock, has been appointed also an Expert under the Pure Seeds Act.

Mr. E. S. Edgerton, Mourilyan, has been appointed Canegrowers' Representative on the Mourilyan Local Sugar Cane Prices Board.

Constables P. G. K. Brennan (Rosedale), H. Sheehan (Emu Park), J. M. Linnane (Meringandan), and A. E. Genrich (Talwood) have been appointed also Inspectors under the Slaughtering Act.

Commodity Boards.

A regulation has been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts empowering the Minister, in the event of any member of a commodity board being unable through illness, absence, or other cause, to attend a meeting of a Board, to appoint some person nominated by such member to act as deputy for such member at the meeting.

Rural Topics.

Pastoral Supplies.

Visitors to the Brisbane Exhibition should make a note to call upon the Queensland Pastoral Supplies Proprietary, Limited. This enterprising firm has its own exhibition at the showgrounds, adjoining Affleck House. For the convenience of country customers a "Reel-Yellow" cab will carry them free of charge within the city area to the Queensland Pastoral Supplies warehouse in Bowen street, near the Fire Brigade. The policy of this firm in supplying direct to the man on the land is becoming more appreciated every year. In addition to supplying the man on the land at wholesale prices, every year there is a new factory established by this firm—their latest factory being for the manufacture of joinery, which embodies the latest machinery, enabling high-class joinery to be sold direct to the consumer at factory prices. This firm issues a comprehensive catalogue, which will be sent to any interested reader free of charge on direct application to the firm. On the roof of their new building at the showground the firm has installed a modern camera obscura, enabling a coloured life moving picture of the whole of the show to be seen. A nominal entrance fee will be charged, and the whole of the proceeds will be devoted to the Crippled Children's Fund.

A Turkey Talk.

Rearing turkey chicks by means of brooders, foster-mothers and other expedients is becoming more and more popular in the old country. Discussing the artificial rearing of turkeys, Edmund Barr has this to say in the current "Farm, Field, and Fireside" (England):—

A broody hen has a natural instinct, and will, to the best of her ability, mother her brood through danger or a bad storm, but where turkeys are being reared by hovers, &c., the operator must think and act for his charges. Two points worthy of mention are wire floors and litter.

Day-old turkey chicks object to some types of wire floors, hesitate to walk for water and food, and soon flag and die; also they will at first eat litter of almost any description with harmful results. The only litter they do not eat is sand, but if this is used it must be clean and dry. Sand, of course, can only be used on a solid floor.

For the first week it is always safest to cut open dry, clean sacks or bags and lay over the wire or the litter. These must be changed for clean ones at least once daily. After a week it is usually safe to use litter, providing it is dry and free from dust. Oat chaff or barley chaff are not suitable. Peat moss or cut straw is far better. The short straw from the thresher also makes suitable litter.

Clean litter should be given at least once weekly; directly it gets obviously dirty, smelly, or damp, it should be changed.

Nearly all the various appliances which rear chickens will rear turkeys successfully, provided they are altered a trifle if necessary. It is not safe to put more than half the number of turkey chicks under a hover intended for a given number of chickens. For the first few days the turkey chicks require a temperature of 95 deg. Fah. in the warm compartment or under the hover.

At first things should be arranged so that the chicks cannot get more than a few inches from the warmth. After three days the amount of exercising and feeding space can be gradually increased, so that at one week they have the entire run of the brooder house.

If semi-intensive rearing is practised, do not be in too great a hurry to let the chicks out. If brooder space is ample they are best under cover for the first two weeks at least. When they are let out they must have an enclosed run, or they wander off and get hopelessly lost.

Chopped green food should be fed, and also a little cod-liver oil should be given mixed in the mash. Brooders admitting direct sunlight should be used. Naturally, the direct sunlight must reach the chicks themselves to prove beneficial.

If huddling or crowding to one certain corner takes place, look for a draught and prevent it, or increase the temperature. Chicks falling over on their backs or breathing with their mouths open denotes that the heat is too great and must be decreased.

This method of turkey rearing needs care and common sense, but in bad weather has a great deal to commend it.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

MATERNAL INSTINCT.

Among what are called the lower animals—we would rather call them our poor relations—maternal instinct is a marvellous thing. Very seldom indeed does it make mistakes. We might go through the whole animal kingdom and give hundreds of examples of this until our readers were tired, but we will content ourselves with one animal, the well-known useful, but certainly not very intelligent, domestic hen. Science has perfected the most ingenious incubators which have become indispensable for the production of chicks on a large scale. Our poultry farmers use them with the skill that comes from long experience. Yet a leading authority among them assured us recently, that for producing the largest number of chicks from a given number of eggs, there is nothing that can equal the broody hen. She sits on her eggs as though they were dearer to her than life. Yet she has the sense to leave them at intervals for a brief cool-off, and does not fail to turn them over when she returns to the nest. Without this there would be a danger of the yolk sticking to the egg-shell, and the spoiling of that chick. Equally well does she mother them when hatched. Not usually courageous, she will risk her life in their defence. She accompanies them in their early scratching expeditions, and when they are tired, she calls them into the shelter and warmth of her body and wings. "Like as a hen gathereth her chickens," said the Master, and we all feel the overwhelming force of this simile.

But what does the maternal instinct do for the human mother? It gives her that most wonderful thing maternal love. It gives her the wish to nourish, to protect, to do her very best for this wonderful babe born of her body. But does it teach her how to do this? Ask the mother of her first-born, whether instinct told her how to give baby his bath, the first time she tried. Instinct probably does impel her to give baby the breast. Yet how weak is that impulse! How many babies have been deliberately fed from the bottle, and so deprived of half their chances of life and health? How many have been weaned early for no good reason? At the least difficulty in breast-feeding, either because the baby did not suck well, or the breast-milk was slow in coming, or the supply appeared scanty, or the mother gave the baby too much, and so upset it, or because some "friend" said, "I think your milk does not agree with the baby," the unfortunate babe was doomed to all the perils of an artificial diet. We have done much to change this, but these practices are not yet extinct.

If instinct fails so often with the average babe, what if the premature babe under five pounds in weight, perhaps only three or four pounds? Occasionally unusually intelligent and careful mothers have succeeded in rearing these delicate infants, but certainly not by

instinct. We are told that one of the world's greatest intellects, Sir Isaac Newton, began life as a tiny red atom of a babe. But how many hundreds and thousands have died, and what may the world have lost? Yet the great majority might be saved if brought early to our Baby Clinics.

Still one occasionally hears a really intelligent woman declare that she thinks the mother's instinct her best guide. This woman may have successfully reared her own family, but she certainly did not do so by instinct. Her success was due to sound traditions received from her own mother or some other, aided perhaps by a little luck. Intelligence (it used to be called reason) is the woman's guide, not instinct. Instinct in our poor relations is certain but narrow, it runs in a groove. Intelligence is capable of meeting any change of circumstance, of combating new and unknown difficulties. It is a much higher endowment than instinct, but it may make great mistakes. It was misguided intelligence that made so many mothers wean their babes; that made our old-time nurses dose the newborn with castor oil, and so upset their little insides from the very start. We might give many other illustrations, but it is unnecessary.

Rearing healthy babes and children is skilled labour, and there are better ways of acquiring skill than by ignorant handling of one's first-born. No woman should be too proud to learn. But, say some, there is so much being printed about Infant Welfare and it is not all in agreement. True, much has been printed. Most of it is good, some poor, some even harmful. That is why these articles are printed always under the same heading to show that they come from a specially trained and responsible service. Do not, however, think that you can acquire skill by reading only. Come to our Clinics and you will understand better what you read.

PACKSADDLE OR COVERED WAGON?

SETTLEMENT OF AUSTRALIA.

By Rev. JOHN FLYNN, of the Australian Inland Mission.

Healthy Motherhood Needed.

ALL who, with growing anxiety, have been reading the writing on the wall, must rejoice that our King's Jubilee has inspired a nationwide Thanksgiving Fund devoted to Australian Motherhood.

While frankly facing alarming possibilities of the marked downward movement revealed by Australia's recent vital statistics, we who endeavour to think in terms of centuries and continents are cherishing a theory that the present "trough" in the Australian birthrate is due to an interesting combination of circumstances, the like of which may not be seen again for many generations.

We must remember that the "extension complex" inherent in pioneers is intensified in their children. Our first Australian pioneers were compelled by countless obstacles to move slowly and to consolidate their gains with care; but, in their children, the original simple urge to move towards new homes has frequently developed into an aimless wanderlust—a disease fatal to family life.

The Bachelor Habit.

Again, although our earliest Australian pioneering was of the "covered wagon" type, *i.e.*, was carried on by families—men, women, and children travelling out together—our later adventures have been largely of the "packsaddle" type, by men alone. It was inevitable that the bachelor habit should emerge, and that, in many remote areas, the phrase of doom, "No encumbrances," should almost eliminate community significance from so-called "occupation."

In many circles it is customary to mourn that modern young people do not care to venture into regions beyond. While there may be some truth in such a lament, there is still more significance in an earlier fact—so many of our hardiest pioneering parents boasted that they had endured privations long enough; and, from the thrones of their success, they ordained that their children must not be exposed to similar drudgery! So they trained their heirs for lives of comparative ease.

Effects of the War.

And then our world was struck by the Great War Comet, with its enormous tail of fearsome complications, which dazed young minds with primary shocks, and exposed them to slow attrition from continuous reverberations in current literature and conversation. Between the joyous carnivals they frequent, the faculties are numbed—might one say bewitched—by mutterings of half-baked philosophers who forget that, from the beginning, the course of this old world has been just one earthquake after another; and that life has always been a grim, though intensely fascinating, endurance test to raise the human family gloriously erect amid our cyclonic environment. Those ugly mutterings have been put into vivid language by Yeats:—

> "Things fall apart; the centre cannot hold;
> Mere anarchy is loosed upon the world,
> The blood-dimmed tide is loosed . . . "

What are we going to do about it?

In our hearts, I hope, we will not take this loss of national nerve too seriously. Our young people, now undergoing a course of refreshing pleasure, will surely be borne back to the shore by a returning surge of hardy patriotism, which must follow as surely as the flowing tide succeeds the ebb. The slow cycle of travail, exhaustion, recklessness, pleasure, will at last bring them round to quietness and confidence. Impatient critics of modern youngsters frequently forget that, in all history, the rank and file of our people have never been subjected to such a terrible bombardment of international alarms, echoed and re-echoed by countless publicity agencies, many of which are more interested in thrills than in truth.

The New Pioneering.

Contemplating the internal affairs, it is particularly necessary to recognise that our young Australian nation is just now passing from the era of extension to that of intension. News from Alice Springs and Tennant's Creek is now commonplace, and what was once "Mythical Darwin" has its own little regiment of press correspondents, having wrested from Sydney and Melbourne the honour of recognition as "Australia's Front Door."

Not by wandering afar will most future fortunes be founded. The excitement of chasing rainbows is steadily being exchanged for normal human occupations—*i.e.*, making the most of familiar assets, previously appreciated only in part.

This process is amply revealed in statistics of city factories; rural enterprises in water conservations for irrigation, stock, and domestic supply; also revolutionary experiments in cultivation of pastures. Such intensive toil makes possible a greater proportion of citizens of yeomen type, binds them to specific environments, and allows their hearts to generate proper appreciation of home realities—of which the chief are healthy heirs for their beloved heritages.

Faith in Action.

Also, I hope, we will not treat this loss of national nerve too lightly; for possible recovery cannot be won without conscious effort. Our arch-enemy is the invisible loss of parental instinct, rather than visible loss of babies actually born. Nevertheless, it is by visible, continent-wide activity towards preventing the lesser loss that Motherhood will be glorified high above all those easier pleasures which are not sought, first through pain, and afterwards through two long decades of uninterrupted devotion to domestic commonplaces.

In short, the present effort to provide adequate safeguards for expectant mothers is really "sacramental"—*i.e.*, an outward and visible sign of an unseen, returning reverence for Motherhood, as the supreme factor in our national life.

Therefore, additional Maternity Wards together with Baby Clinics now being provided for busy cities and country towns, brought within reach of Australia's most isolated habitations by means of adequate Aerial Medical Services, will constitute tangible proof of national sincerity—that we still believe life is worth living; that the fundamental obligation for all good citizens is to ensure healthy, happy cradledom.

IN THE FARM KITCHEN.

Roast Brisket of Beef.

Take about 4 or 5 lb. fresh brisket of beef and some salt. Rub the meat all over with the salt and let it stand till next day. Take a roasting tin (the bottom of which has been well covered with cold water), place meat in and cover with another tin or enamel dish. Put into gas oven, turning the flame low, for one hour, then remove top tin and increase heat as for roasting. Let the brisket cook near top of oven for half an hour. When cooked place on a hot dish and return to oven until required. Pour off any surplus fat in the tin and make gravy by adding flour and mixing well with liquor in tin, add pepper, salt, and boil till it thickens.

Braised Brisket of Beef.

Take 4 lb. fresh brisket of beef, 2 carrots, 1 turnip, 2 stalks of celery, 1 or 2 leeks, a little parsley, thyme, bay-leaf, 12 peppercorns, salt, stock, a few slices of bacon. For the sauce, take 1½ oz. of butter, 1½ oz. flour, stock. Cut about ¼ pint each of carrot and turnip and put them aside. Slice remainder of carrot and turnip, leeks, and celery, and place them in a stew pan just large enough to contain the meat. Lay the meat on top of the vegetables, and cover with slices of bacon, add parsley, thyme, bay-leaf, a little salt, and nearly enough stock or water to cover the vegetables. Put on a close-fitting lid and cook very gently for four hours. The carrot and turnip dice must be cooked separately, in well-flavoured stock, until tender, and they may be added to the sauce or arranged in groups round the dish, on which meat is served. To make the sauce, put butter in a small saucepan till melted, add flour, stir, and cook slowly until well browned, and then add stock, using that from large saucepan if no other is available. Stir until it boils, add seasoning, and use.

Roast Shoulder of Veal.

Take a shoulder of veal, some bacon rashers, chopped parsley, breadcrumbs, suet, grated lemon rind, salt, pepper, and 1 egg. Make sufficient forcemeat with the parsley, breadcrumbs, suet, grated lemon rind, salt, pepper, and egg to fill cavity after removing bone. Cut off knuckle and remove bladebone from shoulder and fill the space with seasoning. Sew up the opening and press meat into a good shape. Cover with a piece of well-greased kitchen paper and roast, basting constantly. Allow sufficient time for the meat to cook thoroughly. Serve with good rich gravy and garnish with curled bacon bashers and slices of lemon.

Stuffed Breast of Veal.

Take 1 breast of veal, 1 lb. sausages, breadcrumbs, a few mixed herbs, 1 egg. Remove bones, spread meat on board and flatten out with rolling-pin, cover with a thick layer of sausage meat, mixed with breadcrumbs, herbs, and sufficient egg to bind it. Roll up meat, tie with narrow tape, and bake in a moderate oven, basting frequently. When cooked remove tape, dish on a hot dish, garnish with sliced lemon and a nice thick gravy poured round.

Stuffed Breast of Lamb.

Take a lean breast of lamb about 2½ lb., 2 oz. breadcrumbs, 1 oz. suet, 1 dessertspoonful chopped parsley, ½ teaspoonful sweet herbs, ½ grated lemon rind, 1 egg, salt, pepper. Prepare forcemeat with breadcrumbs, suet, chopped parsley, herbs, lemon rind, salt, and pepper. Bind with beaten egg, mix well, and spread over the breast. Roll up and skewer and bake in a fairly hot oven for one and a quarter hours.

Roast Topside Beef.

Take 4 lb. topside beef, ½ lb. dripping (this is a very economical joint, and few take advantage of it as a roast. There is no bone and very little fat on it, which ought to bring it more into favour). Place the joint in a baking dish with plenty of dripping and a little cold water. Cook for about one and a-half hours, basting frequently, as this adds to the success of the joint.

Danish Tripe.

Take 1½ lb. tripe, ½ lb. onions, 1 cupful breadcrumbs, a little sage, salt, pepper, ½ lb. thick slices bacon. The tripe must be large enough to fold over. Make a seasoning of onions, breadcrumbs, sage, salt, pepper, and put a thick layer on tripe. Fold over and sew edges together to keep seasoning in, put in a baking dish, lay slices of bacon on top, and bake for one hour. Put on a hot dish, make a gravy thickened with flour, and pour over tripe. Serve with mashed potatoes.

WAYS OF USING UP CORNED BEEF.

Corned Beef Toast.

Take some cold corned beef, ¾ oz. butter, 2 eggs, 1 tablespoonful milk, 1 tablespoonful gravy, pepper, squares of hot toast. Mince beef, put butter into a saucepan, add meat, milk, gravy, season with pepper. Beat 2 eggs and stir in until the mixture thickens; then pour on squares of toast.

Toad in the Hole.

Take slices cold corned beef, ½ lb. flour, 2 eggs, 1 pint milk, salt, pepper. Mix flour in a basin with salt. Beat eggs in milk and stir into flour gradually, beating well all the time. Cut meat into neat pieces and place in a well-greased baking tin, pour over the batter, and bake in a hot oven for one hour.

Corned Beef Surprise.

Take ¾ lb. corned beef, 1 oz. butter, 1 oz. flour, 1 cup milk, 3 eggs, salt, pepper, small onion. Put beef and onion through mincing machine, make a thick sauce with the butter, flour, and milk, add beef, salt, and pepper, and mix well. Then add beaten egg-yolks and cook for five minutes. Allow to cool, then fold in stiffly-beaten egg-whites and bake in a deep buttered piedish for three quarters of an hour. Serve at once.

Corned Beef Rissoles.

Take cold corned beef, 1 small onion, breadcrumbs, herbs, pepper, salt, 1 tablespoonful chutney, egg, a little gravy. Put beef and onion through mincing machine, mix with breadcrumbs, salt to taste, pepper, chutney. Moisten with half of egg and gravy, and shape into rolls or balls. Dip in egg (using the half left over), then breadcrumbs. Fry in hot fat.

Orchard Notes for September.

THE COASTAL DISTRICTS.

SEPTEMBER is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State— it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the foregoing has been written mainly in respect of citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting, all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, two to three eyes are left spaced around

the butt, and surplus ones being removed, the top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each ''plant'' being covered by a few inches of soil immediately) beetle-borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

Where necessary, manure—using a complete fertilizer rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash—two of the former to one of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared—viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens—and when the soil requires feeding, it should be manured with a complete manure; which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertilizer in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

BLACK aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts, which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

Farm Notes for September.

WITH the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing..

The following subsidiary crops may be sown during the month:—Peanuts, sweet potatoes, arrowroot, cow cane, and in those districts suited to their production yams and ginger. Plant out coffee.

EXPIRED SUBSCRIPTIONS.

A very large number of subscriptions to the Journal expired in June and July, and have not been renewed. A further large number expires with this issue.

Subscribers whose term expired in June and July have been continued on our mailing list, and a yellow wrapper on this month's Journal (August) is an indication that their subscriptions are now due.

Subscribers whose term expires with this issue are reminded similarly.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June. 1935.	June. 1934.
North Coast.	In.		In.	In.
Atherton	1·66	34	0·57	2·74
Cairns	2·82	53	1·89	1·71
Cardwell	2·02	63	2·41	3·38
Cooktown	1·99	59	1·38	0·30
Herberton	1·14	49	0·86	2·73
Ingham	2·36	43	2·49	3·83
Innisfail	7·16	54	7·11	7·49
Mossman Mill ..	2·08	22	5·40	1·02
Townsville	1·34	64	0·11	2·39
Central Coast.				
Ayr	1·45	48	..	1·40
Bowen	1·61	64	0·07	1·75
Charters Towers ..	1·25	53	1·15	0·52
Mackay	2·65	64	0·68	4·03
Proserpine	3·24	32	0 83	1·54
St. Lawrence ..	2·49	64	0·46	1·56
South Coast.				
Biggenden	2·22	36	..	3·52
Bundaberg	2·88	52	0·52	3·77
Brisbane	2·72	84	0·06	0·76
Caboolture	2·75	48	..	1·46
Childers	2·52	40	0·12	2·30
Crohamhurst ..	4·57	42	0·46	1·60
Esk	2·27	48	0·05	0·89
Gayndah	1·84	64	..	2·54
Gympie	2·70	65	0·11	1·44
Kilkivan	2·14	56	0·05	2·47
Maryborough ..	3·04	64	0·02	1·49
Nambour	3·82	39	0·03	1·35
Nanango	2·02	53	..	1·41
Rockhampton ..	2·59	64	0·40	2·29
Woodford	2·96	48	0·04	1·41

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June. 1935.	June. 1934.
Central Highlands.	In.		In.	In.
Clermont	1·68	64	1·27	1·18
Gindie	1·46	36	..	2·62
Springsure ..	1·78	66	1·16	3·04
Darling Downs.				
Dalby	1·69	65	0·13	1·60
Emu Vale	1·54	39	0·07	1·18
Hermitage	1·80	29	0·03	0·59
Jimbour	1·70	47	0·07	1·29
Miles	1·82	50	0·13	1·67
Stanthorpe	1·94	62	0·44	0·94
Toowoomba ..	2·42	63	0·18	1·11
Warwick	1·76	70	0·20	0·64
Maranoa.				
Roma	1·59	61	0·38	1·06
State Farms, &c.				
Bungeworgorai ..	1·36	21	0·07	0·99
Gatton College ..	1·87	36	0·08	0·79
Kairi	1·46	21	..	3·13
Mackay Sugar Experiment Station	2·35	38	0·80	2·47

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure, Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·95	79	65	83	30	60	22	138	5
Herberton	..	70	51	80	10	36	18	86	6
Rockhampton	30·11	75	52	85	9	37	25	40	4
Brisbane	30·13	70	50	77	9	41	24	6	2
Darling Downs.									
Dalby	30·16	68	38	76	1	24	24	13	2
Stanthorpe	..	61	31	68	1	18	24	44	3
Toowoomba	..	63	40	72	1	32	18, 24, 26	18	2
Mid-Interior.									
Georgetown	29·99	81	56	89	10	36	18	195	3
Longreach	30·12	73	45	84	8, 9	33	24	343	5
Mitchell	30·18	67	36	78	1	23	24, 25	95	5
Western.									
Burketown	30·03	79	59	89	10	49	27	365	4
Boulia	30·12	71	47	87	4	38	24	261	5
Thargomindah	30·16	66	43	79	5, 6	31	24	188	3

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August. 1935.		September. 1935.		MOONRISE. Aug., 1935.	MOONRISE. Sept. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·36	5·20	6·9	5·35	7·23	7·23
2	6·35	5·20	6·8	5·35	7·51	7·53
3	6·35	5·21	6·7	5·36	8·20	8·27
4	6·34	5·21	6·6	5·36	8·48	9·5
5	6·33	5·22	6·5	5·37	9·17	9·45
6	6·33	5·22	6·4	5·37	9·51	10·35
7	6·32	5·23	6·3	5·38	10·24	11·32
						p.m.
8	6·32	5·24	6·2	5·38	11·4	12·34
9	6·31	5·24	6·1	5·39	11·52	1·39
					p.m.	
10	6·30	5·25	6·0	5·39	12·47	2·47
11	6·29	5·25	5·58	5·40	1·46	3·54
12	6·28	5·26	5·57	5·40	2·50	5·5
13	6·27	5·26	5·56	5·41	4·1	6·11
14	6·26	5·27	5·55	5·41	5·11	7·22
15	6·25	5·27	5·53	5·42	6·22	8·31
16	6·24	5·28	5·52	5·42	7·29	9·39
17	6·24	5·29	5·51	5·42	8·34	10·44
18	6·23	5·29	5·50	5·43	7·42	11·44
19	6·23	5·30	5·49	5·43	10·48	a.m.
20	6·21	5·31	5·48	5·44	11·53	12·40
21	6·20	5·31	5·47	5·44	a.m.	1·31
22	6·19	5·32	5·45	5·45	12·54	2·16
23	6·18	5·32	5·44	5·45	1·52	2·54
24	6·17	5·33	5·43	5·45	2·45	3·28
25	6·16	5·33	5·42	5·46	3·34	3·58
26	6·15	5·34	5·41	5·46	4·17	4·27
27	6·14	5·34	5·39	5·47	4·52	4.56
28	6·13	5·35	5·38	5·47	5·25	5·24
29	6·12	5·35	5·37	5·48	5·56	5·55
30	6·11	5·36	5·36	5·48	6·25	6·29
31	6·10	5·36			6·53	

Phases of the Moon, Occultations, &c.

7 Aug.	☾ First Quarter	11 23 p.m.
14 ,,	○ Full Moon	10 43 p.m.
21 ,,	☽ Last Quarter	1 17 p.m.
29 ,,	● New Moon	11 0 a.m.

Apogee, 3rd August, at 4.6 a.m.
Perigee, 15th August, at 6.6 p.m.
Apogee, 30th August, at 12.18 p.m.

On the 16th, at 6 a.m., Saturn will be 6 degrees south of the Moon, when 16 degrees above the western horizon.

At 8 p.m., on the 24th, Mercury and Neptune will reach a point in the sky near the hind legs of the Lion, and be apparently only one-tenth of a degree apart, and will then be below the western horizon. The planets will set at Warwick at 6.36 p.m., therefore to obtain any view of this apparently-wonderful closeness (though they are really separated by about 3,000 million miles), a telescope must be used sometime before 5 p.m.

Two other planets, Mars and Jupiter, will apparently meet or be within 2½ degrees of one another on the 28th at 9 a.m., nearly an hour before rising. They will afford an interesting spectacle if a telescope or field-glass is used when they are 15 degrees above the horizon, 16 degrees south of east.

Saturn will be in opposition to the Sun on the 31st, rising as the Sun sets. It will be apparently amongst the stars of Aquarius, nearly 10 degrees south of the celestial equator, and passing over Torres Strait about midnight.

Mercury will be invisible, rising only 35 minutes before the Sun on the 1st, and setting only 22 minutes after it on the 15th.

Venus sets at 8.25 p.m., 3 hours 5 minutes after the Sun on the 1st; on the 15th it sets at 7.52 p.m., 2 hours 25 minutes after it.

Mars sets at 11.41 p.m., 6 hours 21 minutes after the Sun on the 1st; on the 15th it sets at 11.21 p.m., 5 hours 54 minutes after it.

Jupiter sets at 12.39 a.m., on the 1st; on the 15th, it sets at 11.49 p.m.

Saturn rises at 7.37 p.m. on the 1st; on the 15th, it rises at 6.39 p.m.

The Southern Cross will be on the meridian at position XII. at 4 p.m. on the 1st, and at 3 p.m. on the 16th to an observer near the 153rd meridian, but 4 minutes later for each degree west of it.

As Venus will set 1 hour 1 minute after the Sun and Mercury 1 hour 20 minutes after it on the 31st, both should be visible after sunset, after which Venus will very soon cease to be an evening star.

6 Sept.	☾ First Quarter	12 26 p.m.
13 ,,	○ Full Moon	6 18 a.m.
20 ,,	☽ Last Quarter	12 23 a.m.
28 ,,	● New Moon	3 29 a.m.

Perigee, 13th September, at 4.6 a.m.
Apogee, 26th September, at 2.36 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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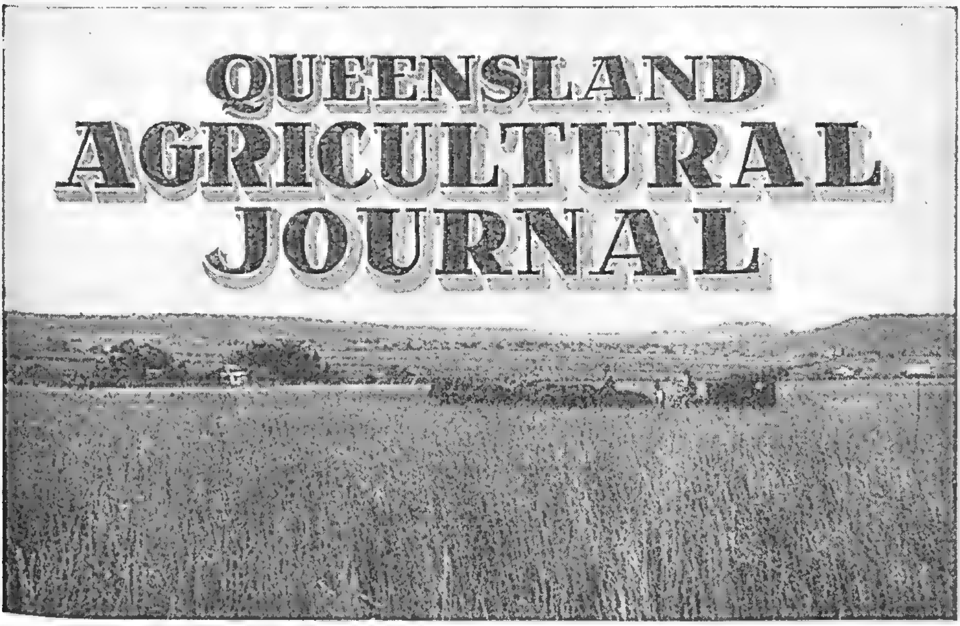

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Event and Comment.

Agricultural Progress.

IN the course of his speech at the official luncheon at the Brisbane Show, His Excellency the Governor, Sir Leslie Orme Wilson, remarked that that big show gave him a wonderful opportunity of renewing friendships which he had formed in other parts of the State and of making new friends. Two things which struck him in visiting shows were the element of progress which was everywhere evident, and that new times demanded new methods. He had a great admiration for the men and women who had laid so well and truly the foundations of the great edifice which was called the State. The people of to-day were doing a good work in building upon those foundations, but the coping stone was still a long way off.

Australia's Marketing Problems.

"MARKETING of our products is just as important as production." That was the keynote of a notable address by the Premier, Hon. W. Forgan Smith, at the same function. "It is recognised by everyone," he said, "that in regard to Australian products only the best is good enough to place on the markets of the world." Continuing, the Premier stated that there could be no one-way traffic in trade—they could not expect to sell unless they themselves were purchasers. He had given the

subject a lot of thought, and from the conversations he had had with leading men in England last year, he had come to the conclusion that it was no use talking about the Ottawa Conference agreements, or about the need or the desirability of Australia and Queensland having markets abroad. There was a technique of negotiations between countries, and that was what he wanted to impress on them that afternoon. It was no use asking Great Britain, with her commercial ramifications all over the world, to accept unlimited supplies of the products they had to dispose of. A trade treaty was under consideration, and, he understood, it was proposed to hold an Empire economic conference next year.

But, he asked, what was wrong with Australia putting all her cards on the table and saying to Great Britain, "We can sell you certain commodities, and in return we will buy certain commodities from you"? If negotiations were carried on along those lines, he felt confident it would lead to satisfactory results. There certainly was nothing wrong with Imperial reciprocity from a business point of view. There was nothing wrong with the principle of trading with those who were prepared to trade with them, and a treaty of that nature would be of mutual advantage to Australia and to Great Britain.

"Queensland, with its great natural resources, had already secured an extraordinary share in the export trade of the Commonwealth, and obviously Queensland's prosperity depended on the restoration of world trade, on the orderly marketing of all Australian produce, and on the general prosperity of Australia," said the Federal Minister of Commerce, Right Hon. Dr. Earle Page, at the same gathering. The restoration of world trade looked as if it would be best and most quickly secured by working on an Empire basis for the re-establishment of triangular trade, Dr. Page continued. It was quite hopeless for Australia to balance its trade with every country it dealt with, but the Empire as a whole might be able to get an approximate balance. Trade between the constituent parts of the Empire should be stimulated to a greater degree. The success of any Imperial arrangement could only be assured by the proper organisation of orderly marketing, towards which end negotiations were now proceeding.

Unfortunately, during the last few months, the position of the legislation that had been passed by the Federal and State Parliaments to assist the orderly marketing, and especially the export control of the great staple industries of Australia, had been threatened on grounds of legal and constitutional technicalities, said Dr. Page. If that threat should unfortunately destroy the marketing legislation, an alteration of the Constitution would be necessary to remedy the position.

To prevent that unfortunate circumstance arising, the Commonwealth Government had made an appeal to all sections of Governments and to all parties in Australia to put the constitutional position beyond doubt, and to confirm what was regarded as the present legal position which permitted that orderly marketing legislation to function. He was glad to say that both the Premier and the Minister for Agriculture in Queensland had subscribed to that appeal, and he asked for general backing, not merely in the interests of the industries directly concerned, but in the interests of the whole of the people of Australia.

Agricultural Consciousness.

ADDRESSING the same assembly later in the proceedings, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, congratulated the Royal National Association on the great success of its Jubilee Exhibition. He spoke of the Association's record of sixty years' progressive service. Incalculable advantages to agriculture had accrued from the efforts of the Association. The great need was confidence in the future of our primary industries. The annual Royal Show encouraged confidence in that direction. Nobody could be blind to the progress agriculture had made. The whole history of our people was intimately concerned with the welfare and progress of the Royal National Association. The Association built up a great city which, although it lasted only for a week, provided a very definite nexus between the executive of that Association and kindred public bodies. The Royal Show put the hallmark of excellence on production.

At one time there was a distinct line of demarcation between the respective spheres of influence of the country and the city, but, thanks largely to the work of the Association, that line of demarcation had disappeared. The Association had rendered a service second to none given by any other body in the State. The standard laid down sixty years ago had been a progressive one, consistently maintained during the long period of the Association's existence. Referring to the fact that there were only dairy cattle exhibits at the first show, the Minister remarked that there were now nearly a million milch cows in Queensland.

"The prosperity of our State," added Mr. Bulcock, "depends upon the prosperity of the primary producer. If we can develop an agricultural consciousness in the city, as the Association is so successfully endeavouring to do, it will radiate throughout the State for the benefit of the State."

The Dignity of Agriculture.

PLEADING for the spreading of the doctrine of the dignity of agriculture, the Minister for Agriculture, in opening the Dairy Produce Hall at the Exhibition, deprecated the tendency of certain newspapers and other publications to caricature the man on the land. "There is nothing more calculated to daunt the aspirations of boys who look to the land as a means of livelihood than ridicule," said Mr. Bulcock. "If you turn to some of our newspapers you see facetious references to and caricatures of the man on the land, who earns his bread by the sweat of his brow and the use of his brains—for, after all, they go together. There is a tendency to refer to these people as 'cockies,' 'hayseeds,' or as 'Dad' and 'Dave,' and other names with equally contemptuous inference." This attitude, the Minister continued, was creating a wrong consciousness, a wrong outlook towards the land. "Let us realise and tell our people," he said earnestly, "that farming is not a profession for the inefficient, either mental or physical—that it requires high mental capacity as well as physical stamina. I would like to see a campaign directed towards elevating and directing public thought in the direction of regarding agriculture as the foremost of professions. We should all be ardent advocates of the dignity of agriculture."

Corn Ear Worm *

By ROBERT VEITCH, B.Sc., Agr., B.Sc., For., F.R.E.S., Chief Entomologist.

ONE of the most destructive Queensland insects is the species now commonly known to cotton and other farmers as the corn ear worm. Among tobacco-growers this insect is generally referred to as the budworm, maize-growers know it as the maize grub, and tomato-growers call it the tomato worm.

The caterpillars, on hatching from eggs laid on cotton, obtain their first meal by feeding on the tender young leaves at the growing tip, or on the very young squares. As the attack progresses the squares are hollowed out (Plate 90; fig. 4) and are subsequently shed. If the corn ear worm outbreak coincides with the commencement of squaring, the squares may be attacked and shed as quickly as they are formed and the attacked plant's energies may be almost completely diverted to vegetative growth, boll production being negligible. Corn ear worm infestation, however, is only one of a number of factors responsible for excessive vegetative growth. The caterpillars also frequently attack bolls of all sizes (Plate 90; fig. 3), passing from one boll to another, the damaged locks in the boll becoming infected with moulds which may spread through the whole boll. Actually the loss of squares is usually more serious than the attack on the bolls, for many of the latter may still yield quite marketable cotton from undamaged locks. The type of attack just described is that normally associated with corn ear worm bred on the cotton plant, but a migratory attack from other areas or host plants sometimes occurs and the plants may then be practically defoliated in the case of a young crop. In older crops, however, the corn ear worm still shows a marked preference for squares and bolls even in the case of a migratory attack.

This species is quite appropriately referred to as the budworm by tobacco-growers, because it displays a very definite liking for the growing tip of the tobacco plant (Plate 90; fig. 6). It may bore down the stem and the terminal bud may be destroyed, thus leading to the production of lateral buds which may also be the subject of attack. Most of the larvæ, however, feed exposed on the leaves which may be either wholly or partly destroyed. When attacking maize the corn ear worm feeds on the silk and the tip of the ear (Plate 90; fig. 8) after first feeding on the leaves. In the case of the tomato the fruit is the main object of attack, entry thereto being generally obtained at the calyx end (Plate 90; fig. 1). Here again the caterpillar shows a marked tendency to move from fruit to fruit, numbers thereof being rendered valueless by a single individual. Lucerne may also be seriously attacked.

Life History and Habits.

The pearly-white dome-shaped eggs (Plate 91; fig. 1) are about half the size of a pin head and are generally laid singly on the flowers, flower buds, or young foliage, the moth normally laying about a thousand eggs during the two weeks of its life. After an incubation period of three to six days, whitish larvæ emerge from the eggs, and in a short time acquire quite a pronounced colour pattern. The colour varies very considerably in the full-grown corn ear worms (Plate 91; fig. 2)

* *Heliothis obsoleta* Fabr.

Plate 90.—Corn Ear Worm.

Fig. 1.—Infested tomato.
Fig. 2.—Infested tomato.
Fig. 3.—Damaged cotton boll.
Fig. 4.—Damaged cotton square.
Fig. 5.—Damaged cotton boll.
Fig. 6.—Attack on tobacco.
Fig. 7.—Attacked maize cob.
Fig. 8.—Attacked maize cob.

some specimens being dark-brown while others are a pale-green, the general colour being varied by a number of stripes of different shades. The caterpillars, which possess eight pairs of legs, are about 1½ inches in length when full growth is attained at the end of two or three weeks. Pupation then takes place in an earthen cell (Plate 91; fig. 4) in the soil at a depth of 3 or 4 inches, the brown pupæ (Plate 91; fig. 3) measuring about three-quarters of an inch in length. During the warmer weather the pupal stage normally lasts ten to fourteen days, at the end of which period the stout-bodied moths emerge (Plate 91; fig. 5). The wing expanse of the moths is about 1½ inches, the forewings being reddish-pink and the hind wings creamy-yellow with large marginal smoky areas.

Control in Cotton.

Experience in Queensland lends little support to the belief that the corn ear worm in cotton can be successfully and economically controlled by the use of insecticides. Hence growers must look to cultural practices as the best line of attack, and, fortunately, there is justification for the belief that strict attention thereto will greatly minimise corn ear worm losses—at least, in so far as the Callide and Dawson Valleys are concerned. In these valleys, but more particularly in the former, agriculcure is practically confined to the growing of cotton, and the problem is thus a fairly straightforward one. Elsewhere it is not so simple because other economic host plants of the corn ear worm such as maize, tobacco, tomato, and lucerne may be extensively grown, thereby constituting a serious complicating factor.

The first point to be noted is the fact that until December, cotton is not an important host plant of the corn ear worm, and by that time it should be squaring freely if early planting has taken place in a normally favourable season. From the middle of December, however, the cotton plant may suffer severe injury, the squares being attacked and shed almost as fast as they are formed. The next important point is that the overwintering pupæ of the corn ear worm give rise to moths in September which means that at least two generations are bred before cotton comes appreciably into the picture, and the caterpillars of those generations must feed on other host plants, the most important weed hosts being the pig weeds, twin leaf, and wild cape gooseberry, bull head and a few allied weeds being also attacked in a lesser degree. Spring crops of maize and tomato may also constitute a menace which will subsequently lead to serious infestation of the much more important cotton crop—i.e., in so far as the Callide and the Dawson are concerned.

The potentially enormous body of favoured weed host plants in the spring and early summer, however, very definitely constitutes the chief menace, and every reasonable endeavour should therefore be made to keep them well in check, both within the cultivated cotton areas and in the vicinity thereof. The areas to be planted should receive thorough preparation to eliminate weeds, and the battle against the weeds in the young crops must be continued as long as practicable. Old cultivation paddocks such as maize fields and wheat fields require attention. The former must, if possible, be ploughed before spring to destroy overwintering pupæ and the latter should be ploughed early, both being planted to a suitable crop. They should on no account be left in a neglected condition, for pig weed and bull head will flourish in such areas and produce an enormous corn ear worm population in the early

PLATE 91.—CORN EAR WORM.

Fig. 1.—Egg × 14.
Fig. 2.—Larva, natural size.
Fig. 3.—Pupa × 1½.
Fig. 4.—Pupa in earthen cocoon × 1½.
Fig. 5.—Adult × 1½.

summer months, thus leading to severe losses in the cotton from mid-December onwards. If standover cotton is ratooned, the weed host plants in it must be cleaned up, but if it is not to be ratooned it should be eliminated as soon as possible. From what has just been said it is evident that success in dealing with corn ear worm in cotton in the Callide and Dawson Valleys is definitely linked up with the elimination of the weeds on which it breeds so freely in the spring and early summer, and the cotton grower must accordingly wage an incessant warfare thereon.

Similar attention to weed elimination in other cotton districts will also be productive of beneficial results, but, as already indicated, in districts other than the Callide and Dawson, alternative host plants such as tomato, lucerne, maize, and tobacco may breed large numbers of the corn ear worm and thus provide a source from which the cotton may be infested. Even so, weed elimination is still worth while, for at the worst it is sound agriculture apart altogether from any beneficial results it may produce in the campaign against the corn ear worm. It is obvious that cotton should be sown at as great a distance as practicable from lucerne and other alternative cultivated host plants so as to minimise the risk of infestation therefrom.

Maize trap crops have been recommended for the control of this pest, and they have undoubtedly proved very useful when handled in a thoroughly efficient manner. Unfortunately, the planting and harvesting of these trap crops must be carefully timed, and experience indicates that in practice the trap crops are frequently not handled as they should be and they thus constitute a menace rather than a protection against infestation.

This discussion on maize trap crops is an appropriate point at which to give consideration to the safest method of producing maize on a cotton farm, either for sale or for consumption on the farm, as stock food. In such cases it is desirable that the maize be obtained from a succession of plantings rather than from a single sowing, but under no circumstances whatsoever, at least in so far as the control of corn ear worm is concerned, should maize be sown earlier than late November, otherwise serious corn ear worm infestation of cotton is almost inevitable. If a single sowing is made it will breed up a large corn ear worm population to spill over into the cotton when the maize is harvested or fails to mature a crop, whereas if a succession of smaller plantings is made, the corn ear worm population will move from the older maize to the younger maize instead of to the cotton.

Control in Tobacco.

One pound of arsenate of lead is thoroughly mixed with 25 lb. of pollard or with a similar quantity of maize meal if it is available. This dry bait is applied every fortnight to the growing tips of the tobacco plants by means of a finely perforated tin can and is attractive to the corn ear worm and also to the cluster caterpillar* which is another species frequently found feeding in characteristic clusters on tobacco leaves.

Control in Tomatoes.

When attempting to control corn ear worm in tomato crops the reader should keep clearly in mind what has been said about the control of this pest in cotton. Weeds on which it can breed should accordingly be eliminated and any useless neglected economic host plants should

* *Prodenia litura* Fabr.

be similarly dealt with. Infested tomatoes can be destroyed by boiling or by any other appropriate method which will kill the larvæ. Many pupæ of this pest will be destroyed if infested ground is thoroughly cultivated prior to planting, such cultivation also destroying weeds on which the corn ear worm or tomato worm may be breeding. Many growers spray or dust their crops with arsenate of lead, the tomatoes being cleaned before marketing. Such a procedure accounts for considerable numbers of the tomato worm, but unfortunately it may be responsible for undesirable quantities of injurious spray residue on the tomatoes when marketed. Hence it seems desirable to dispense with the application of arsenical dusts and sprays to tomato plants carrying fruit. A suitable non-arsenical insecticide may be evolved, but that is a matter for future experimentation,

Control in Maize.

Insecticidal treatment of growing maize is both impracticable and financially unsound, hence protection against corn ear worm attack on this crop can be attempted only along the general cultural lines discussed when considering its occurrence in cotton and tomatoes.

Control in Lucerne.

The position with respect to infestation in lucerne is similar to that outlined in the case of maize, insecticidal control being out of the question, partly because of the cost and partly because of poisoning risks. Premature harvesting of a heavily infested crop will appreciably increase the corn ear worm mortality and the succeeding crop may consequently be much less heavily infested.

Fused Needle of Species of Pinus.

PROGRESS REPORT.

By H. E. YOUNG, B.Sc.Agr., Assistant Plant Pathologist.

A CONDITION similar to that known elsewhere in Australia as "fused needle" has occurred in Queensland in exotic trees of the genus *Pinus* during the last few years and on account of its economic importance has attracted considerable attention. The species of *Pinus* with which Queensland is most concerned are *P. caribæa* and *P. tæda*, and both of these are susceptible to the conditions, particularly *P. tæda*. The species in which the symptoms have been recorded are: *P. tæda*; *P. caribæa*; *P. palustris*; *P. radiata*; *P. echinata*; *P. muricata*; *P. serotina*; *P. insularis*; *P. montezumæ*; *P. excelsa*.

Apart from a few trees of various little used species the only ones planted in Queensland from which fused needle has not been recorded are *P. patula* and *P. longifolia*. Trees of all ages appear to be liable to attack, specimens being found amongst nine months old nursery seedlings and in plantation trees planted in 1918.

SYMPTOMS.

The condition is manifested by a resinosis of the terminal buds and a twisting and adhesion of each needle in the fascicle, the latter symptom giving rise to the name. The resin is exuded by the terminal buds and on hardening a tight impervious jacket is produced, gumming the bud scales together into a solid mass, which may offer sufficient mechanical resistance to prevent a continuation of growth. When this occurs secondary buds are formed below the affected area and a condition of multiple leaders may result. This process is liable to occur again and again and a stunted shrubby tree results. If the buds do manage to burst, the needles in each fascicle are twisted spirally about each other and are closely appressed giving the appearance of short spikes.

Sections through such "fused" needles show that no actual cell fusion is present but that the needles are held together by a film of resin and the above mentioned twisting. It is noteworthy that, where a stoma of one needle is appressed to the surface of one of its companion needles, then the epidermal cell on the surface opposite the stoma often grows out into a peg like outgrowth into the stoma (Plate 92), this is no doubt due to growth taking place in a restricted area, where the stoma provides the only available space for growth to occur. These pegs from one needle into the opposite stomata would also help in keeping the needles in each fascicle fastened together.

In some cases the ends of the fascicles may be free, in others none of the needles adhere but are loosely twisted together. In extreme cases the fascicles are either unable to burst through the fascicle sheath or only the tip of the twisted gummed up fascicle protrudes. Such a growth usually exhibits a terminal bud well saturated with resin and is accordingly suppressed. These resin coated buds do not die immediately but remain green for many months.

In a number of cases there is no "fusion" or twisting in evidence, but the needles become very short and fine often being reduced to one fourth of their usual length with a corresponding decrease in thickness.

Resinosis though occasionally found in such cases does not usually occur. It is thought probable that this condition is a different manifestation of an effect due to the same cause. It has been particularly noted in *P. tæda* and *P. radiata*.

The checking of the growth of the trees due to the suppression of the terminal buds obviously seriously affects the growth increment as also does the decreased effective leaf surface due to the adhesion of the needles. Owing to the formation of multiple leaders, great loss is also sustained, and in addition as a result of the scanty production of needles and their adhesion, an open tree results in which little or no shading out of the lower laterals occurs. No trees have yet been recorded as having been killed by the disease, but in a few cases a decrease in the actual height of the trees is occurring, resulting from the suppression of each new set of terminal buds and the production of new ones below them again.

Inspection of the root systems of diseased and healthy trees shows no noticeable differences.

INCIDENCE OF THE DISEASE.

In one compartment at Beerwah planted in 1927-28, approximately 70 per cent. of the trees are affected, *P. tæda* and *P. caribæa* being the species in question. This was the area in which the condition was first noted and also the first planted area in that locality. The other areas on the plantation show a very much lower incidence of the disease varying from 1 per cent. to 24 per cent. In a nursery count of *P. caribæa* in 1934 it was found that 0.5 per cent. of the seedlings were affected and in view of the possible infectious nature of the disease all infected seedlings were culled out.

There appears to be a gradual increase in the incidence of the disease year by year, the greatest increase taking place from midsummer to autumn. The infection is also increasing in the newer plantations. This is illustrated in Table 1.

Table 1 indicates that *P. tæda* is more generally attacked than *P. caribæa*, which point is borne out by general observation. In addition it is noticeable that the attack is more severe with *P. tæda*.. The effect on the terminal buds previously discussed is frequent in the case of *P. tæda*, but infrequent in *P. caribæa*. Data on the relative effect of the disease on growth is at present being collected.

The chief area of infection in Queensland is at Beerwah on the coastal plain though the disease is found in other areas in Queensland at higher altitudes.

POSSIBLE CAUSES OF THE FUSED NEEDLE CONDITION.

In considering the factors which might have some bearing on the production of the fused needle condition the following were taken into consideration:—(*a*) Climate; (*b*) Soil—Mechanical factors; (*c*) Soil—Chemical factors; (*d*) Genetics; (*e*) Entomological factors; (*f*) Fungus or bacterium; (*g*) Virus; (*h*) Root and crown balance; (*i*) Mycorrhiza.

Each of these has received attention and, although the work has by no means reached a stage at which definite conclusions can be arrived at, it will be of interest to briefly review the progress which has been made in the several directions.

TABLE 1.—PROGRESS OF THE OCCURRENCE OF FUSED NEEDLE IN FOUR OBSERVATION PLOTS AS ILLUSTRATED BY PERCENTAGE INFECTION AT DIFFERENT DATES.

Date Inspected.	Plot A. *P. tæda.* Planted 1927–28.	Plot B. *P. tæda* and *P. caribæa.* Planted 1927–28.	Plot C. *P. caribæa.* Planted 1927–28.	Plot D. *P. caribæa.* Planted 1932.
25 August, 1933	53·6	..	..	..
10 November, 1933	53·6	..	..	..
23 January, 1934	59·0	37·0	26·0	..
3 April, 1934	62·3	50·8	55·0	3·3
21 June, 1934..	74·4	60·4	67·9	14·7
3 January, 1935	79·5	65·9	72·5	19·0
6 June, 1935..	..	68·0	73·4	24·7

Climate.

In the consideration of the possibility of the disease being due to climatic factors it was realised that the condition occurs under a very wide range of climatic conditions. The disease has been reported in New Zealand, Western Australia, South Australia, Victoria, New South Wales, the Federal Capital Territory, and Queensland. In passing from one of these places to the others there are all variations of climate from that of the cool temperate zone in New Zealand to that of the tropical zone in parts of Queensland, from zones of winter rainfall to zones of summer rainfall and so on. It occurs on a wide variety of elevations from a few feet above sea level to the mountains of the Dividing Range some two thousand feet higher. Again the species listed as attacked have different requirements in regard to climate judging from the locations of their native habitats, yet they are all susceptible to the disease under the same conditions which fact is a strong argument against climate being the primary cause of the disease.

With the two species chiefly under consideration in Queensland, viz., *P. caribæa* and *P. tæda* a careful comparison made between the climates of their habitats in America and at Beerwah showed a similarity between the conditions in Florida and at Beerwah with the difference perhaps that the rainfall in Florida is a little more evenly distributed throughout the year.

Soil—Mechanical Factors.

As with climate the trees showing the condition occur on many types of soil from pure sands to stiff clays. On land which has been cultivated there is less incidence of the disease but this is possibly due to other factors than the improved mechanical condition of the soil because it occurs also on loose loamy sands which should give all the mechanical freedom required. It occurs on deep soils and shallow soils, on gravels and fine clays so that the mechanical composition does not appear to have a direct bearing on the problem.

Soil—Chemical Factors.

As with climate and the mechanical condition of the soil the chemical compositions of the various soils on which the disease occurs cover a wide range, from almost pure sands to the rich red volcanic soils derived from basalts. It is found on grey forest soils, on laterites and on podsols; in fact, it occurs on all the types of soil on plantations

in Queensland. The red basaltic soils show only an infrequent specimen of an affected tree. The highest incidence is on the sandy soils and the grey forest soils but it is by no means confined to these. In the water logged swamp sands it is just as frequent as on well drained ridges. Anaylses of all these soils show no appreciable deficiency in any of the usual essential elements and the variation in soil types would seem to rule out the possibility of any such deficiency, and in any case, in numerous instances healthy trees are found growing alongside very badly affected trees in apparently the same soil type. This would require a very improbable distribution of any such element.

The results of twenty soil analyses are given in Table 2. The samples were taken to a depth of eleven inches and a sample was taken from beneath a healthy and a diseased tree on the same site. It will be noted that there is but little difference between the soils as shown in the table. In all cases the soils were generally poor, but both diseased and healthy plants occurred on soils of similar types. Further analyses are being made.

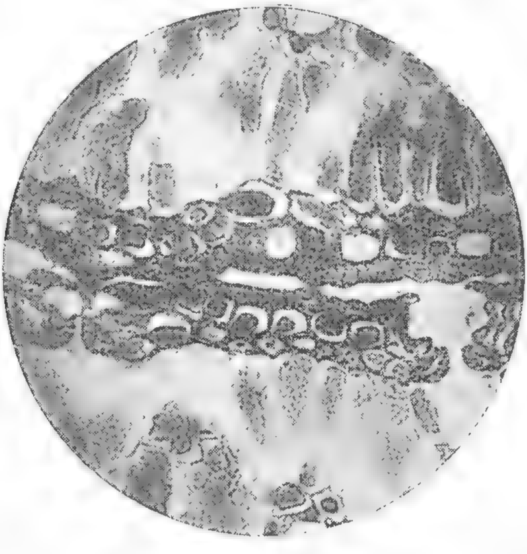


PLATE 92.—Section of a fused fascicle of *Pinus tæda*, illustrating the outgrowth from one needle into the opposite stoma.

A preliminary treatment of individual trees with the essential elements and also with boron, zinc, copper, and aluminium was carried out with negative results. A more detailed experiment with a proper experimental layout has been designed.

An experiment designed to test the efficacy of soil cultivation as a means of combating the condition has also been laid out. Other experiments involving variations in soil include the transplanting of healthy trees to the site previously occupied by a diseased tree and *vice versa*, the potting of healthy trees in soil obtained from beneath diseased trees and *vice versa*, and the potting of healthy and diseased trees in various types of plantation soil. Adequate controls are supplied in all cases. Final results from these experiments are not yet available.

It is noticeable that diseased trees when potted into a good potting soil containing an abundant humus supply recover from the condition,

TABLE 2.

CHEMICAL ANALYSES OF SOILS FROM HEALTHY AND DISEASED TREES.

Sample.	Nitrogen. %		Humus. %		Percentage Citric Acid Soluble Plant Foods.								pH.	
					P_2O_5.		CaO.		MgO.		K_2O.			
	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.
1	·022	·018	·75	1·37	·0020	·0026	·0108	·0146	·0098	·0119	·0088	·0064	6·09	5·91
2	·025	·018	·98	·57	·0017	·0018	·0168	·0127	·0065	·0090	·0022	·0030	6·17	6·05
3	·020	·018	·57	·93	·0008	·0024	·0273	·0145	·0120	·0083	·0030	·0024	6·47	6·36
4	·038	·028	·83	1·0	·0006	·0005	·0186	·0096	·0067	·0025	·0035	·0030	5·94	5·91
5	·057	·046	1·29	1·03	·0005	·0005	·0842	·0783	·0067	·0067	·0021	·0021	6·34	6·34
6	·040	·055	·81	·93	·0005	·0006	·0125	·0149	·0073	·0108	·0078	·0040	5·75	5·62
7	·017	·028	·50	·20	Trace	Trace	·0187	·0124	·0051	·0066	·0029	·002	6·05	5·96
8	·056	·068	1·5	1·0	Trace	Trace	·0139	·0085	·0065	·0036	·0016	·002	5·29	5·81
9	·077	·023	1·42	·47	Trace	Trace	·030	·021	·0064	·0114	·0009	·0179	6·05	6·36
10	·041	·036	·80	·68	Trace	Trace	·0234	·0151	·0060	·0075	·0010	·0040	5·68	6·03
Average ..	·039	·035	·94	·82	..	..	·0256	·0202	·0073	·0078	·0034	·0047	5·98	6·04

and yet on the other hand the disease is found in well manured nursery soil; but there, perhaps, the influence of competition may have the effect of producing starvation.

Chemical analyses of material collected from diseased and healthy trees show no great dissimilarities. The comparative infrequency of the disease on old cultivated land could be due to fertilizers which had been added to the soil, but other observations appear to contradict this conclusion.

Genetics.

No record of the occurrence of the disease has been found in America and it does not seem likely that such a frequently occurring heritable characteristic would have escaped recognition in the native habitats of the species. Seed supplies obtained each year have presumably involved many different parent trees, and yet the disease is apparent in seedlings from all batches of seed, and again since it occurs in so many species of *Pinus* it would appear to be too great a coincidence for it to be due to the same factor appearing in each of the species noted. No work has been attempted on the lines of testing the relative susceptibility of the progeny of diseased and healthy trees.

It appears improbable that an heriditary factor is the cause of the condition.

Entomological Factors.

Apart from being the vector of a virus it was thought that some sucking insect might, by piercing the tissues, be causing the exudation of resin. Examinations have failed to reveal any evidence of insect attack, and treatment of the buds with liberal quantities of resin has failed to produce any of the symptoms of fused needle. In the southern states an insect (*Chermes* sp.) heavily infests *Pinus* spp. and was thought perhaps to have some connection with the disease, but this insect does not occur on the worst affected areas in Queensland.

Fungus or Bacterium.

Attempts at the isolation of any pathogen capable of causing the disease have not been successful, nor have any indications of the presence of such been discovered with the microscope. Inoculations of healthy plants with tissue and tissue extracts from diseased plants have not been followed by the appearance of fused needle symptoms.

Virus.

This aspect at first appeared promising but is now considered as being improbable. The possibility of a virus implied the existence of a vector, probably an insect, but no indications of any insect having been correlated with the disease have been found. As already mentioned *Chermes* sp. was given some attention in the Southern States, but as it does not occur in the chief Queensland fused needle areas it was here dismissed as a possibility.

The position of affected trees in various areas showed that the occurrence is very sporadic, with no definite focus of attack. In fact counts radiating in a number of directions from the worst infected area at Beerwah, which incidentally was that in which the occurrence of the trouble was first noted in Queensland, gave absolutely negative evidence of any infection gradient with that compartment as a focus.

PLATE 93.—Specimens of *Pinus tæda* affected with fused needle disease.

Even within infected areas the individual trees seem to be scattered in an apparently haphazard manner, so that when the positions of trees are plotted the occurrence of the disease has no apparent correlation with any probable centre of attack.

Grafts between diseased and healthy tissues have been made both in the field and in potted plants. In all cases diseased material was used as the scion and the healthy plant as the stock. In all cases so far ready for analysis the diseased scion has regained its health and the healthy stock has remained healthy, indicating that no active infection was carried with the malformed scion to the healthy stock. Diseased *P. caribæa* has also been successfully grafted on to healthy *P. tæda,* resulting in the recovering of the *P. caribæa* scion.

In view of the excellent serological results achieved with known viruses and bacteria it was decided to utilise this method of investigating "fused needle" as a disease of supposed parasitic origin. The virus of tobacco mosaic was very satisfactorily used as a control and the technique employed was that used by Helen A. Purdy (Journal of Experimental Medicine, 1st June, 1929).

One litre of mixed needles and buds from badly affected fused needle trees were minced finely and 25.0 c.c. of physiological saline was added. The material was placed in a linen bag and the juice expressed into a basin. Barium sulphate was added to the expressed juice in order to precipitate the colloids and the supernatant fluid was centrifuged to deposit all the remaining solid materials.

As regards control, three young leaves from a tobacco plant showing mosaic were taken and ground up in a mortar with 25.0 c.c. of physiological saline. The material was then centrifuged until clear.

An antigen consisting of the extract from healthy pine needles and buds was also made up in the same manner as was that from the diseased trees.

Three rabbits were taken and inoculations were made in the marginal ear veins in the usual fashion, the procedure followed out being in accordance with that shown in Table 3.

Anaphylaxis occurred at the fifth injection and consequently to avoid this 0·5 c.c. of the inoculum was administered and the remainder after a period of twenty minutes; the animals were thus desensitized. Unless desensitization was carried out the animals died convulsively.

TABLE 3.

INOCULATION OF RABBITS TO PRODUCE IMMUNE SERA.

RABBIT (1).		RABBIT (2).		RABBIT (3).	
FUSED NEEDLE ANTIGEN.		HEALTHY ANTIGEN.		TOBACCO MOSAIC ANTIGEN.	
Period in Days.	Amount Antigen.	Period in Days.	Amount Antigen.	Period in Days.	Amount Antigen.
..	·5 c.c.	..	·5 c.c.	..	·5 c.c.
3	1·0 c.c.	3	1·0 c.c.	3	1·0 c.c.
3	2·0 c.c.	3	2·0 c.c.	3	2·0 c.c.
3	4·0 c.c.	3	4·0 c.c.	3	4·0 c.c.
3	·5+3·5 c.c.	3	·5+3·5 c.c.	3	·5+3·5 c.c.
3	4·0 c.c.	3	4·0 c.c.	3	4·0 c.c.
15	15·5 c.c.	15	15·5 c.c.	15	15·5 c.c.

Allowing an incubation period of fourteen days, the rabbits were then bled aseptically by cleaning an ear and snipping the edge and collecting the blood in a sterile vessel.

The blood was then allowed to clot overnight in the ice chest and then the serum was drawn off.

The serum was inactivated by heating in a water bath for one hour at 56°C.

Fresh antigens were prepared as before from diseased trees, healthy trees, and diseased and healthy tobacco plants. The healthy pine needles were obtained from a locality where up till then no fused needle had been reported.

The anigens were used in a dilution of 1 : 6 of normal saline.

The antisera were absorbed (Table 4) in the case of tobacco mosaic by adding 1 c.c. of healthy antigen dilution (1 part antigen to 4 parts normal saline) to 2.5 c.c. of inactivated immune serum from each rabbit and incubating for one hour at 37°C. (water-bath). A heavy grey white precipitate was formed in each case, and this was removed by centrifuging and the sera allowed to stand in the ice chest overnight, when a further precipitate was deposited. This process was repeated until on addition of further antigen no precipitate was formed even after standing overnight in the ice chest. This process of precipitating absorption with antigens from healthy plants removed all the antibodies to the respective plant protein, leaving only those antibodies which were formed against any supposed extraneous proteins in the antigens, such as a supposed virus or bacterium, e.g. tobacco mosaic virus. The addition of 3 c.c. of healthy antigen dilution proved to be sufficient for the complete precipitin absorption of 2.5 c.c. of immune tobacco serum.

In the case of antisera to diseased and healthy pine extract, the precipitin absorption (Table 4) was carried out as follows: One c.c. of undiluted healthy antigen was added to 2 c.c. of immune serum (inactivated) and a heavy grey white precipitate was produced. The sera were incubated for one hour at 37°C. and placed in the ice chest overnight; the serum was then drawn off. A further 1 c.c. of healthy antigen was then added to the serum in each case again giving a heavy precipitate on incubation and standing. In this way it was found that 6 c.c. of undiluted healthy antigen were required to absorb the precipitins against plant protein in 2 c.c. of either healthy or diseased immune serum prepared as described.

In the case of both tobacco and pine the absorbed sera were then tested, in each case with both healthy and diseased antigens for the presence of further precipitins (Table 5). A series of dilutions of both antigens and antisera were used. All the precipitin tubes were placed in the water bath at 37°C. for one hour and then in the ice chest overnight before finalising the readings. One volume each of absorbed inactivated immune serum to healthy and diseased tobacco was taken and an equal quantity of diseased antigen added to each tube. This was repeated, using healthy antigen instead of diseased. A large number of titrations, using different amounts of the various antigens, were also used. In all cases on incubation a precipitate was formed where tobacco virus antigen was added to tobacco virus absorbed immune serum, and in no other cases, showing that the technique was not faulty.

TABLE 4.

PRECIPITIN ABSORPTION, USING ANTIGEN FROM HEALTHY PLANTS.

Extract—Pine Needles.						Extract—Tobacco Leaves.					
Healthy.			Fused Needle.			Healthy.			Mosaic.		
Immune Serum.	Healthy Antigen.	Precipitate.	Immune Serum.	Healthy Antigen.	Precipitate.	Immune Serum.	Healthy Antigen.	Precipitate.	Immune Serum.	Healthy Antigen.	Precipitate.
2 c.c.	1 c.c.	+	2 c.c.	1 c.c.	+	2·5 c.c.	1 c.c.	+	2·5 c.c.	1 c.c.	+
2 c.c.	2 c.c.	+	2 c.c.	2 c.c.	+	2·5 c.c.	2 c.c.	+	2·5 c.c.	2 c.c.	+
2 c.c.	3 c.c.	+	2 c.c.	3 c.c.	+	2·5 c.c.	3 c.c.	—	2·5 c.c.	3 c.c.	—
2 c.c.	4 c.c.	+	2 c.c.	4 c.c.	+	..	..	..	..	..	..
2 c.c.	5 c.c.	+	2 c.c.	5 c.c.	+	..	..	..	..	..	..
2 c c	6 c c.	—	2 c.c.	6 c.c.	—	..	..	..	..	..	..
2 c.c.	6 c.c.	+	2 c.c.	6 c.c.	+	2·5 c.c.	3 c.c.	+	2·5 c.c.	3 c.c.	+

TABLE 5.

TITRATION OF ANTIGENS AGAINST ABSORBED IMMUNE SERA. NUMERALS REPRESENT COMPARATIVE VOLUMES.

Extract—Pine Needles.						Extract—Tobacco Leaves.					
Healthy.			Fused.			Healthy.			Mosaic.		
Absorbed Immune Serum.	Healthy Antigen.	Precipitin.	Absorbed Immune Serum.	Fused Antigen.	Precipitin.	Absorbed Immune Serum.	Healthy Antigen.	Precipitin.	Absorbed Immune Serum.	Healthy Antigen.	Precipitin.
5	5	—	5	5	—	5	5	—	5	5	+
5	1	—	5	1	—	5	1	—	5	1	+
5	·5	—	5	·5	—	5	·5	—	5	·5	+
5	10	—	5	10	—	5	10	—	5	10	+

This was repeated, using the immune sera obtained from healthy and diseased pine extracts and healthy and diseased pine antigens. In no case did the absorbed sera produce a further precipitate on incubation and standing in the ice chest overnight. If the technique is applicable here as with tobacco this would show that no agent extraneous to the plant itself was concerned with the disease.

This serological work should, of course, also apply in the case of a pathogenic infection by a fungus or bacterium.

A number of microscopic sections of diseased tissue were examined but no evidence of phloem necrosis, which is often associated with virus troubles, was found.

As a result of these considerations the virus theory as to the origin of the disease is not now being given great attention in Queensland.

Root and Crown Balance.

Taking the view that there might possibly be some factor missing either in the soil or due to root trouble of some description which, not being supplied to the crown in sufficient quantities, might thus cause "fused needle," it was decided to heavily prune the crown in order that this possible factor might then be concentrated enough in the remainder of the crown to eliminate the trouble. Accordingly a plot, consisting of 150 trees of *P. tæda,* was laid out. At the commencement of the experiment the plot showed 50 per cent. of the trees badly affected with "fused needle" disease. The trees were pruned clean, to the top two whorls of branches on 21st August, 1934. On 3rd January, 1935, observations showed that the percentage of diseased trees had fallen to 33.5 per cent., and on 27th May, 1935, to 32·4 per cent., whilst none of the previously healthy plants had contracted the disease. The plot was situated in compartment 1, Beerwah, where the other observation plots noted in the introduction showed a decided increase over the same period. This lead is being followed up with reference to the section dealing with mycorrhiza.

Mycorrhiza.

It was at the commencement of the investigations thought that the wrong species of symbiotic fungus in relation to the roots of the trees by the formation of toxins, by its inability to supply the correct carbohydrates to the tree, or by direct parasitism, might be causing the disease. On this account a survey of the possible mycorrhiza formers on *P. tæda* and *P. caribæa* was made. In all cases the only fruiting bodies found in direct and constant association with plantation trees in Queensland were those of a species of *Boletus* identified as *Boletus granulatus.* In many cases mycelial filaments were traced from the sporophores to the mycorrhizal roots of the pine trees. There appeared to be a slight variation in the form of the sporophore in several different localities, but this proved to be a minor variation and the fungi are now considered to be the same. Isolations have been made from the sporophores and the soil in which sterile seedlings were growing in pots inoculated with it, with positive results resulting in the formation of typical mycorrhiza. No symptoms of "fused needle" have yet developed in these seedlings.

Inspections of the root systems of diseased and healthy plants fail to show any significant differences either as regards type of rooting system or the presence of a root parasite. The sporophore of *B. granulatus* has been found beneath both diseased and healthy trees.

It was realised that there might be some other factor which, associated with the presence of the particular fungus, causes the disease, and accordingly it was thought desirable to obtain cultures of the mycorrhiza formers from the native habitats of the species of *Pinus* concerned; unfortunately these have not yet been obtained. If the local mycorrhiza-forming fungus is unsuitable and thus causes "fused needle," then trees inoculated with a suitable species of fungus should be immune to the disease. This has yet to be investigated.

The work on the mycorrhizas of forest trees carried out by Dr. M. C. Rayner, of London, shows that "incorrect mycorrhizal equipment is probably an important factor in resistance to disease," and that "incorrect equipment may cause a physiological disturbance manifesting itself in various ways." Dr. Rayner stresses the importance of a correct supply of humus on which the mycorrhiza work and from which are manufactured the various carbohydrates which the plant is thus enabled to obtain and use. In the present case if the plant is securing an unsuitable food supply from its mycorrhiza then it is thought that the physiological upset might be "fused needle."

Experiments in connection with the supplying of humus to "fused needle" trees are in progress with the object of following up this line of investigation. Plots have been laid out for treatments with litter and cover crops in different locations, and cultivation of the soil is being tried also. Pot experiments, involving variations in soil and humus, are also being carried out. It is perhaps noteworthy that the sporophores of *B. granulatus* have not been found on sites severely affected with "fused needle"; this seems to point to a deficient or unsuitable form of humus supply which does not permit the fruiting of the mycorrhizal fungus.

SUMMARY.

The condition known as "fused needle" is described and its host range given.

As the plantations become older the incidence of the disease becomes more frequent. *P. tæda* is more subject to attack than *P. caribæa*.

It is thought that climatic factors have no direct bearing on the occurrence of the disease.

There appear to be no correlations between mechanical and chemical features of the soils and the occurrence of the disease. Experiments to gather additional data on these points are under way, including fertilizer experiments, but preliminary work shows negative results.

The disease does not appear to be due to any genetic peculiarities of the planting stock.

No entomological visitations can be connected with the occurrence of the disease, and bacterial and mycological agencies are improbable.

From serological investigations it appears that the disease is not due to a virus, nor can the disease be transmitted by grafts.

Experiments involving the disturbance of the balance of root and crown appear to indicate that when the crown is reduced recovery is often affected though the tree, in consequence of the pruning, shows little growth.

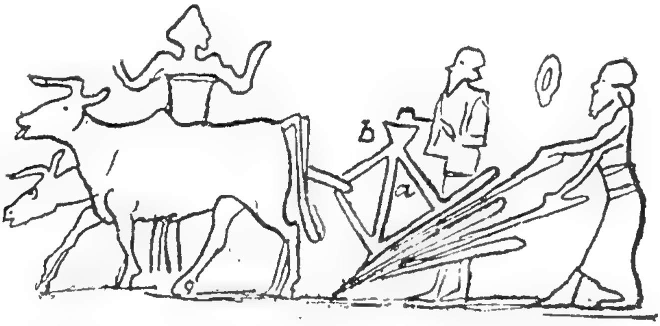
B. granulatus is the mycorrhiza-forming fungus in Queensland plantations. The question of the suitability of this fungus to the requirement of the pines is being investigated. Experiments with the object of supplying food material to the mycorrhizal fungus are under way, as it is thought possible that the malnutrition of the fungus may be causing the upset in the plant's economy.

ACKNOWLEDGMENTS.

Valuable assistance was rendered by the Agricultural Chemist, who kindly undertook the analyses of the soils and plant material involved in the investigations. Thanks are also due to the Director of Pathology of the Brisbane and South Coast Hospitals Board and to the Director of the Animal Health Station at Yeerongpilly, for the use of rabbits and facilities at their respective laboratories. Dr. M. C. Rayner, of the London University, has rendered substantial assistance in regard to the work on mycorrhiza.

NOTHING NEW UNDER THE SUN.

So said Ecclesiastes, expanding the theme in the following verse: "Is there a thing whereof men say, See this is new? it hath been already, in the ages which were before us."



The drawing here presented, which was taken from a Babylonian stone seal (presumptive date earlier than 2000 B.C.), and reproduced in Professor Breasted's "History of the Early World," would appear to provide strong support for the theorem, for here surely is the prototype of the present-day seeding machine—not to speak of the modern cane planter. Professor Breasted adds the following description: "The seeder is drawn by a yoke of oxen with their driver beside them. Behind the seeder follows a man holding it by two handles. It is very pointed and evidently makes a shallow trench in the soil as it moves. Rising from the frame of the seeder is a vertical tube (a) on the top of which is a funnel. A third man walking beside the seeder is shown dropping grain into the funnel." If a drawing of a cane planter were to be made by chipping on a small stone, it is at least doubtful whether any very essential difference would be found between it and the drawing reproduced above.—"The Australian Sugar Journal" for August.

Helminth Parasites of Domesticated Animals in Queensland.

FURTHER RECORDS OF OCCURRENCE.

By F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

IN 1934 the writer published a check list of the helminth parasites of domesticated animals in Queensland. Several species, hitherto unknown in Queensland, were recorded for the first time. Since the publication of this check list, several species not recorded therein have been met with in routine examinations. These are given below.

Host—Domestic Pigeon.

Houttuynia sp.—A tapeworm belonging to this genus was found in a pigeon from Brisbane. The only species of the genus recorded from the pigeon is *H. torquata* Meggett, 1924, which is described from Burma. The specimen examined by the writer conforms in most respects to this species, but as a number of rostellar and sucker hooks were missing, the specific determination was left in abeyance.

Host—Domestic Fowl.

Raillietina (*R*) *echinobothrida* (Megnin, 1880).—Numerous small specimens of a tapeworm determined as belonging to this species were collected from a fowl at Brisbane. The small intestine was marked throughout with small nodules.

Host—Sheep.

An examination of helminth material from sheep from various localities showed the following Trichostrongyles to be present, none of which have previously been recorded from this host in Queensland:—

Ostertagia trifurcata—Ransom, 1907.
Cooperia punctata—(v. Linstow, 1907).
Cooperia oncophora—(Railliet, 1898).
Cooperia pectinata—Ransom, 1907.
Nematodirus spathiger—(Railliet, 1896).
Trichostrongylus vitrinus—Looss, 1905.
Trichostrongylus probolurus—(Railliet, 1896).
Trichostrongylus rugatus—Mönnig, 1925.
Trichostrongylus falculatus—Ransom, 1911.

Oesophagostomum venulosum—(Rudolphi, 1809).—Numerous specimens of this species were taken by Clunies Ross some time ago from sheep on a property near Dirranbandi, South-western Queensland, but the writer is not aware of any published record of its presence in this State. It has since been collected from two localities in the Goondiwindi district and from an adjoining property at Dirranbandi.

Host—Rabbit.

Recently a survey was made of the gastro-intestinal parasites of twenty-five rabbits from the Goondiwindi district. All the rabbits came

from a property on which helminths, mainly the small Trichostrongyles, had been causing losses among young sheep over a period of about six months.

Trichostrongylus retortæformis (Zeder, 1800).—This nematode was present in varying numbers in the small intestine of all rabbits.

Trichostrongylus colubriformis (Giles, 1892).—Five males of this species were collected from three rabbits.

Trichostrongylus vitrirus (Looss, 1905).—A single male of this Trichostrongylid was observed in one of the rabbits from which two male *T. colubriformis* were secured.

The occurrence of *T. colubriformis* and *T. vitrinus* in the rabbit is, so far as the writer can determine, the first record of the presence of these two sheep helminths in this rodent host, and indicates that the rabbit may act as a reservoir for the dissemination of the eggs of these two nematodes over sheep pastures.

Passalurus ambiguus (Rudolphi, 1819).—This pinworm was present in the colon and cæcum and occasionally in the small intestine of all rabbits. Several of the animals were infested with enormous numbers of these worms, but their condition did not appear to be affected by the infestation to any noticeable extent.

Multiceps serialis.—A single specimen of the larva of *Tænia serialis* was collected from the lumbar muscle tissues. The following measurements are given for the hooks:—Large hooks, 118μ to 126μ; small hooks, 88μ to 108μ.

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Animal Nutrition.

By E. H. GURNEY, A.A.C.I., Agricultural Chemist.*

THE successful and economical feeding of farm stock for any definite purpose is a matter that has occupied the attention of the stock owner and scientist for many years.

The amount of information upon this subject that is now available is very extensive, but in stock feeding, as in other subjects of human investigation, the more knowledge gained indicates how much more there is to be known.

Stock nutrition may be considered from various standpoints, including the function in the animal body of the different ingredients contained in foodstuffs; the value of different feeds; the production or return desired from the feeding of stock; the particular feed requirements of the different kinds of stock; farm grown foods; and the conservation of fodder.

Stock Foods.

For the purpose of illustrating the function of the different ingredients of food in the body, a comparison of the animal body with an engine at work has frequently been made by writers when dealing with animal nutrition. The engine has to be supplied with fuel to produce the power required from it, and the engine will not efficiently produce power if supplied with an insufficient amount of fuel, or with poor quality fuel, or unsuitable fuel. By continuous working portions of the engine wear out and require repairing, and such repairs have to be made with different material.

The animal requires food to maintain life and normal production, and its food may be classified into different groups. Thus the sugars, starches, fibre (carbohydrates) of the food are utilised by the animal for the energy and heat it requires.

Throughout the life of the animal there is a continual breaking down of the material of its body and, like the engine, the animal's body requires repairing and building up, and the food ingredients that enable such building up and repairing to take place are nitrogenous bodies called Protein.

Again, the mineral matter of the food is required by the animal to maintain the normal amount of mineral matter of the skeleton and fluids of the body and, as will be mentioned later, there is a particularly heavy demand on the mineral matter in the body of animals when producing and yielding milk, and sufficient mineral matter must be available in the food to replace any deficiency of mineral matter caused by this heavy demand and maintain the animal in good condition.

Repeating briefly, the functions of the different food ingredients are—Carbohydrates and fats produce energy and fat, and when assimilated in any excess are stored as fat in the body. Proteins build up flesh and repair waste. Mineral matter (ash) build skeleton and supply mineral content of fluids of body.

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* In a broadcast lecture from the A.B.C. National Radio Station 4QG, Brisbane, and 4RK, Rockhampton.

Food Values.

Knowing the functions of the different food ingredients, it is possible to consider the food value of different feedstuffs, but when comparison of different feeds is being made it must be recognised that factors other than the actual composition of the feed have to be taken into consideration, thus the digestibility of the different feeds and their palatability are two very important items that must not be overlooked.

It is known that through consumption of a succulent palatable food stock receive greater benefit than from a food which may contain an equal amount of food ingredients but is less palatable. The mention of palatability will direct attention to young green grass and green fodder crops.

Grass, in connection with stock feeding, has been for some few years past the subject of much attention and research in all countries of the world, both in the older countries where cultivated pastures and meadows have been in existence for long periods of time, and in countries where farming may be said to be only of recent date.

The close attention now being given to grass and grass cultivation is due to different reasons, but particularly, it is considered, to the recognition of the economic value of the very high food content that exists in young grass growth.

The higher feed value of young grass, in fact the higher feed value of all young plant growth, as compared with older growth, is owing to the young growth having very much higher protein and mineral content and lower fibre content than exists in older growth; and still further that all the food ingredients of the young growth are much more digestible than such ingredients in older plant growth.

Different methods are adopted in making practical use of the high food value of young grass. The grass area may be subdivided into a number of paddocks 2 to 3 acres in extent, and these paddocks grazed alternatively in such a way that after grazing off the different paddocks in succession the first paddock has a further growth of young grass to be grazed. This is briefly a description of what is termed rotational grazing. Suitable fertilizer application is generally necessary for the most successful results from this method.

If the number of grazing stock available is insufficient to utilise all young grass, or owing to climatic conditions excessive grass growth occurs, such excess grass is mown and made into hay, which forms a very valuable reserve food for use in times of scarcity.

When pasture paddocks are not subjected to rotational grazing, and good grass growth occurs, if this is mowed—some time before maturity—and made into hay, the stockowner will have a reserve supply of highly nutritious foodstuff whenever required.

From what has been stated it will be understood that the best returns cannot be obtained from milking cows when their food is mostly grass in a matured stage of growth. Such feeding was a common practice in the past, but improved methods of farming, which include the regular feeding of dairy stock with nutritious fodders, are, happily, becoming more general.

Grass as a Crop.

If the best return from any grass is to be obtained, it must be recognised that introduced grass or grasses on any land should be considered as a crop; the grass land should, therefore, receive the cultivation

given usually in preparation for any farm crop. Other succulent feeds, such as green fodder crops—maize, oats, sorghums, Sudan grass, &c.—are, in common with all green foodstuffs, of great value to stock, insofar as they supply palatable food with a beneficial laxative effect and vitamin content.

These fodders are of very similar composition, the green oats as fed usually containing as a rule a somewhat higher protein content. If maize and sorghums are not fed in the green stage, they can be converted into ensilage, which forms a succulent feed in times of scarcity of other succulent foods.

These green fodders and ensilage require to be supplemented with food material of higher protein content, such as linseed, cotton seed meal, or grass hay containing clover, or lucerne hay or chaff.

Legumes.

Leguminous crops are particularly valuable to the farmer for two reasons—their high protein and mineral content; and their capacity of improving the land on which they are grown. These crops, therefore, are most useful in supplementing other forage crops used in animal rations, in that they are capable of supplying relatively cheaply the protein and a considerable quantity of the minor material necessary to make a balanced ration.

The legumes (plants with pods) include lucerne, clovers, cowpeas, other varieties of the pea family, vetches, and soy bean.

Lucerne is considered the most valuable fodder crop the stockowner can grow, for it yields good crops per acre, is fairly drought resisting, and, as mentioned before, has high protein content. Therefore, it cannot be stated too definitely that where conditions are suitable for lucerne growth, lucerne should be grown, for it can replace some of the dearer protein containing concentrates required for any complete ration, and is valuable as pasture, hay, or chaff.

The clovers, the growth of which are increased in laid-down pastures by the application of superphosphate, are valuable for the same reasons as lucerne; and mixed grass and clover hay make rich, palatable reserved foodstuff.

Cowpea, although grown chiefly for green manure, also furnishes a rich foodstuff, either green or as hay.

The foodstuffs so far mentioned may be termed green and dry roughage of varying food value. Another class of stock food goes under the name of concentrate, for it contains higher percentages of the different food ingredients—proteins (or fats) or carbohydrates. By using some of these concentrates together with bulkier roughage, it is possible to compose rations giving all the food requirement for any animal's maintenance, and the production required of it.

It will be understood when feeding animals, then, that the purpose for which the food is to be given must be considered, whether it is given for maintenance only—or to supply the requirements of both maintenance and production.

When Feeding is Unprofitable.

Successful results from any stock feeding can only be obtained when the principles underlying correct feeding are appreciated fully and followed consistently. Consideration, of course, has to be given to the

value of any production obtained, and the cost entailed in such production. Further, the feeding of unthrifty animals or unsuitable animal types is unprofitable, even if feeding is in accordance with established principles. For instance, some cows are only capable of yielding relatively small quantities of milk, although supplied with an ample and correctly balanced ration. Such cows should be culled, for their presence in the herd results in less production without lowering the costs.

When dealing with stock feeding it is necessary to consider any proposed ration from two points—maintenance and production. The object of feeding may be to produce growth, milk, fat, or work, but it must be understood that before any such production can be obtained, a certain portion of the ration must be utilised by the animal for generating the heat and energy necessary for the maintenance of the normal functioning of the animal body. It will be seen, then, that it is only the food in excess of the maintenance requirement that can be used by the animal for production purposes. That food is required for both maintenance and production is often overlooked, which is evidenced when milking cows are allowed to be dependent practically on the grass alone. Some stock owners make the mistake that because there is apparently plenty of grass there must be sufficient food for milking cows. Such grass, which is frequently of a self-sown indigenous variety, is generally not of very high feeding value, particularly when it is more or less mature; and although it may be possible that there is sufficient food for maintenance, the quantity of this grass which a cow is capable of consuming does not provide, after maintenance requirements are satisfied, enough extra food for the cow to produce milk to her highest capacity. In fact, the cow when consuming a food containing not much more than her maintenance requirements in the effort to produce milk will supply material from her body for this purpose, and thus the animal's constitution becomes weakened and less disease resistant.

Computing the Ration.

When computing any ration for stock, the necessity will be seen of first estimating the quantity of fod required for maintenance, after which the quantity of food required for production can be decided. Thus, in computing a ration for milking cows, the first thing to consider is the quantity of food required for maintenance.

Stated in terms of starch equivalence a 10 cwt. cow requires for maintenance feed with 6½ lb. starch equivalence including about 0.7 lb. digestible protein. The content of food required by the animal to produce a gallon of milk varies a little according to the quantity of fat contained in the milk. Thus a gallon of milk with 3 per cent. butter fat will require food of 2.1 lb. starch equivalence value including 0.57 lb. digestible protein, while a gallon of milk with 4 per cent. fat will require food of 2.6 starch equivalence including 0.66 lb. digestible protein. Stated in terms of total digestible nutrients instead of starch equivalence according to the American authorities Henry and Morrison, the maintenance food required by a 1000 lb. cow must contain7·9 lb. total digestible nutrients including 0.7 lb. digestible crude protein. The variation, according to fat per cent. of milk, of food required for production of milk as stated by these authorities is quoted in the leaflet "Rations for Dairy Cows" published by the Queensland Department of Agriculture and Stock. Rations for other kinds of stock, providing for maintenance and production are set out similarly.

Stock Foods.

Naturally grass should be the first stock food to be considered and it is repeated that when grass pastures are laid down, such pastures should be considered as a fodder crop. Therefore, the soil requires similar cultivation to that given when preparing land for fodder crops. When well established, the great value of these pastures to stock is recognised, and a number of experimental plots for the purpose of introducing suitable winter grasses in different districts have been set out under the control of the Pasture Improvement Committee of the Department of Agriculture and Stock.

There is not any very marked varieties in the food value of the different grasses, provided that comparison is made at the same stage of maturity, but it must be emphasised that very great differences do exist in the food value of the same grass at different stages of its growth. The difference in food value of grass at different stages of growth is shown particularly in the protein and mineral content, and in illustration of this fact the following analyses are quoted. (These analyses were made on the water-free material of the grass.)

——	Protein.	Lime.	Phosphoric Acid.
	Per Cent.	Per Cent.	Per Cent.
Paspalum-short young grass 6 inches high contained	20	0·41	0·62
Paspalum-stemmy, with ripe seed heads	4	0·23	0·14

In this case, the young paspalum contained five times more protein, twice as much lime, and four times more phosphoric acid than the old matured paspalum. Rhodes grass, young leafy growth contained 16.4 per cent. protein and 0.72 per cent. phosphoric acid, while an older growth in full seed head contained practically only $\frac{1}{3}$ of these percentages, viz., 5.6 per cent. protein and 0.23 per cent. phosphoric acid.

As to the value of any grass as a stock food, it is recognised that it is necessary to take into consideration other factors as well as the chemical composition of the grass. Thus different grasses require different soil types and climatic conditions for their most successful growth. Again, grasses vary in their character of growth, some being of more or less leafy and succulent growth, others of more stemmy and less digestible nature.

It is well known that clovers have a high protein and mineral content and that being succulent and digestible, their inclusion in pasture increases its food value.

Although sown pastures in the young stage of growth may in some cases be capable of supplying sufficient food material for maintenance and production, grass as a general rule—certainly grass of the grazing paddock—is considered as roughage.

Fodder crops such as maize, sorghum, Sudan grass, and cow cane, have somewhat similar food value, and when used in any ration are considered as roughage. Such crops are of great value in supplying succulent feed in times of green grass scarcity.

Lucerne must be considered as the most valuable fodder crop available to the stock feeder, and owing to its high feed value cannot be considered only as roughage when included in a ration.

Hays and chaffs of the different crops and ensilage being generally of somewhat low feed value (excepting lucerne hay and chaff) form when included in a ration the roughage portion.

Some concentrates commonly used in composing stock rations are meat meal, blood meal, linseed and cottonseed meals, maize meal, bran, pollard, and the grains maize and oats.

A cow yielding 25 lb. milk of 3.5 per cent. fat would require a maximum of 2.2 lb. of digestible crude protein and about 15.5 lb. total digestible nutrients. For maintenance this cow requires 0.7 lb. protein and for the production of the 25 lb. milk 1.5 lb. protein. The following daily ration supplies the required protein:—65 lb. green sorghum, 7 lb. lucerne chaff, and 7 lb. maize meal.

The 65 lb. sorghum (roughage) yields 0.78 lb. protein, that is very little more protein than the cow requires for maintenance. The 7 lb. lucerne chaff yields 1.08 lb. of protein and the 7 lb. maize meal yields 0.35 lb. protein. From this the value of the lucerne chaff is seen, in so far as it supplies practically half the required amount of protein. Therefore, as previously stated, lucerne although on account of the bulk it provides it could be called roughage: yet on account of its high food value it may be termed a concentrate.

PLATE 94.—A BANANA AND COFFEE PLANTATION, BUDERIM MOUNTAIN, SOUTH QUEENSLAND.

Pig Feeding Experiments.

Report by J. E. LADEWIG, Q.D.A., B.Sc.Agric.

THESE experiments were conducted at the Animal Health Station, Yeerongpilly, under the direction of the Pig Nutritional Committee.

The objective of these tests was to determine whether pigs could be economically raised to pork and bacon weights suitable for the export market with the complete exclusion of milk foods from the ration. Meat meal, manufactured by the Queensland Meat Industry Board at the Brisbane Abattoir, was used as the protein supplement, as this is a source of protein which is reasonably cheap, and large quantities of which are available locally at the Brisbane Abattoir. These tests were initiated in an endeavour to solve one of the major problems of the pig industry in Queensland. Climatic conditions in Queensland are not always favourable to the continuous production of pigs throughout the year. There are periods of dry weather when crop growth is seriously interfered with, when natural and artificial pastures fail to produce as they would do during normal seasons. The winter season while not a long or harsh one is very often a dry one, followed by dry weather during the spring months. These conditions on farms lead to a diminishing supply of dairy by-products—skim milk in particular—as food for pigs, and in the absence of an economical substitute for skim milk pig production falls off, becomes less profitable and both local and export markets are affected.

With the object of finding an economical substitute for skim milk these tests were commenced in February, 1934, and finished in May, 1935. For the purposes of this experiment the four principal breeds of pigs have been used in both in the purebred form and with reciprocal crosses of the several types, the objective throughout being the production of a white-skinned pig for the export trade.

Breeds Used.

The breeds and crosses used were as follows:—

Purebreds—Large White, Middle White, Tamworth, Berkshire.

Crossbreds—Berkshire x Large White, Berkshire x Tamworth, Berkshire x Middle White, Tamworth x Large White, Tamworth x Berkshire, Middle White x Large White.

Grades—Middle White-Tamworth x Middle White.

This variety of types has given a fairly comprehensive range of pigs with which to ascertain the value of the rations used.

Housing.—The pigs were housed under the intensive system, being confined to pens 18 feet by 8 feet, half covered in; the covered part was floored with hardwood over concrete, whilst the open portion was floored with concrete.

Foods Used.

The rations used in these experiments were as follows:—

Maizemeal	45 per cent.
Pollard	40 per cent.
Meat meal	8 per cent.
Lucerne chaff	7 per cent.

A mineral supplement consisting of 75 per cent. calphos (a bone meal product) and 25 per cent. salt was added to the rations at the rate of 2 lb. per 100 lb. of the above mixture.

An analysis of the complete mixture gave the following results:—

Moisture	11·2 per cent.
Protein	18·0 per cent.
Fibre	4·5 per cent.
Fat	4·0 per cent.
Carbohydrates	57·2 per cent.
Ash	5·1 per cent.
Included in ash—	
Lime (CaO)	0·829 per cent.
Phosphoric acid (P_2O_5)	1·749 per cent.
Salt	0·73 per cent.

Clean drinking water was provided, and a suitable amount of green fodder was given to the pigs at midday. This fodder consisted chiefly of green paspalum grass, but green lucerne was fed occasionally when available.

From the time of weaning until the completion of each animal's test the pigs were given their food, *ad lib.*, in the dry form in self-feeding hoppers.

Routine Work.

The pigs were reared from birth in the experiment pens; the male pigs were castrated at six weeks old, all were weaned at eight weeks old and were placed in the feeding test at nine weeks old, by which time they had become accustomed to this system of dry feeding.

They were weighed regularly at weekly intervals and the food consumption was recorded for the same period. When each animal or group reached a suitable condition for marketing (either as porkers or baconers) the final weight was taken and they were despatched to the Brisbane Abattoir for slaughter and inspection. Reports were obtained on the suitability of the carcasses, which were then exported to the United Kingdom, where they were further examined and reported upon as to general suitability for British trade requirements. As an additional guide to the condition of the carcasses, one carcass from each different type of pig was sectioned across the loins, and these sections were then photographed for permanent records.

Observations.

In the early stages of these experiments it was observed that the pigs, which on external appearance appeared to be in ideal condition for slaughter, were, upon sectioning of the full rounded carcass, mostly overfat; this observation was substantiated by overseas reports. The pigs slaughtered during the latter period of the test have therefore been slaughtered in much lighter condition, a condition that usually does not appeal to the observer, but upon sectioning, these lighter conditioned carcasses have shown an excellent "eye of meat" (i.e., the proportion of lean meat) with a very desirable proportion of fat.

In these experiments it was noted that the pigs showed small growth rates up to the age of twelve weeks in comparison with milk-fed pigs, but after this age much better growth rates were observed. This is illustrated in Table 1, which gives the average daily gain in weight per pig, based upon the fifteen litters of pigs used in these experiments.

TABLE 1.—DAILY GAIN IN LIVE WEIGHT PER PIG.

Type of Pig.	9–12 Weeks.	12–15 Weeks.	15–18 Weeks.	18–21 Weeks.	21–24 Weeks.
	Lb.	Lb.	Lb.	Lb.	Lb.
Tamworth x Large White	0·92	1·04	1·46	1·73	1·47
Tamworth x Large White	0·79	0·86	0·90	1·42	1·65
Tamworth x Large White	0·78	0·98	1·54	1·59	1·84
Large White	0·71	1·36	1·21	1·70	1·72
Large White	0·67	1·14	1·14	1·58	..
Mid White	0·45	0·59	1·12	1·45	..
Berkshire x Mid White	0·47	0·89	0·77	1·00	..
Berkshire x Large White	0·73	1·07	1·38	2·01	..
Berkshire x Large White	0·98	1·16	1·42	..	..
Berkshire x Large White	0·87	1·10	1·57	..	..
Berkshire x Tamworth	0·87	1·28	1·44	..	..
Tamworth x Berkshire	0·64	1·01	1·78	..	..
Mid White x Large White	0·71	1·35	1·35	..	..
Berkshire	0·65	0·83	1·17	..	..
Mid White-Tamworth x Mid White ..	0·50	0·92	1·37	..	..
Average Daily Gains based on 15 Litters	0·72	1·04	1·31	1·56	1·67

The low growth rates from nine to twelve weeks are probably due to the fact that the pigs' digestive organs at this stage are not able to efficiently utilize the nutrients in the ration, whereas from fifteen weeks onwards, when the best growth rates are observed, they are sufficiently mature to make the most efficient use of their food.

When this system of feeding is compared with skim milk feeding from the point of view of growth rates, it gives less satisfactory results up to the age of fifteen weeks, after which the growth rates are much better than those obtained when skim milk is fed.

A summary of the results obtained with the different types of pigs used in this test is given in Table 2, which also includes the average results based upon 104 pigs.

TABLE 2.

Type of Pig.	Final Live Weight.	Dressed Weight.	Loss on Slaughter.	Food Consumption.	Food Costs.	Food Consumption per lb. Dressed Weight.
	Lb.	Lb.	%	Lb.	d.	Lb.
Tamworth x Large White ..	188	142	24·4	540	404	3·80
Tamworth x Large White ..	160	114	28·7	399	317	3·51
Tamworth x Large White ..	156	113	27·6	454	364	4·03
Large White Pure	191	143	25·2	581	442	4·13
Berkshire x Tamworth ..	139	105	24·4	367	285	3·50
Berkshire x Large White ..	107	75	29·9	221	171	2·95
Berkshire x Large White ..	127	86	32·3	319	254	3·71
Berkshire x Large White ..	118	81	31·3	256	212	3·16
Large White Pure	111	77	30·6	254	211	3·30
Berkshire Pure	103	74	28·2	270	216	3·65
Mid White Pure	106	76	28·3	272	216	3·58
Tamworth x Berkshire ..	105	73	30·5	231	173	3·16
Mid White x Large White ..	97	66	32·0	234	195	3·55
Berkshire x Mid White ..	97	67	30·9	248	206	3·70
Mid White-Tamworth x Mid White	107	75	29·9	266	201	3·55
Average based on 104 Pigs..	126·3	90·1	28·7	325	257	3·61

A feature of note in these results is the variation in the amount of food required to produce 1 lb. dressed weight; this figure varies from 2·95 lb. to 4·13 lb., with an average of 3·61 lb. for the whole series of pigs. This variation is probably due to the fact that some types of pigs are able to more efficiently utilize their food than other types. In this experiment it has been found that the Berkshire x Large White cross makes the best use of the food.

The average figure of 3·61 lb. of food required to produce 1 lb. of dressed weight is less than the generally accepted figure for the meal feeding of pigs.

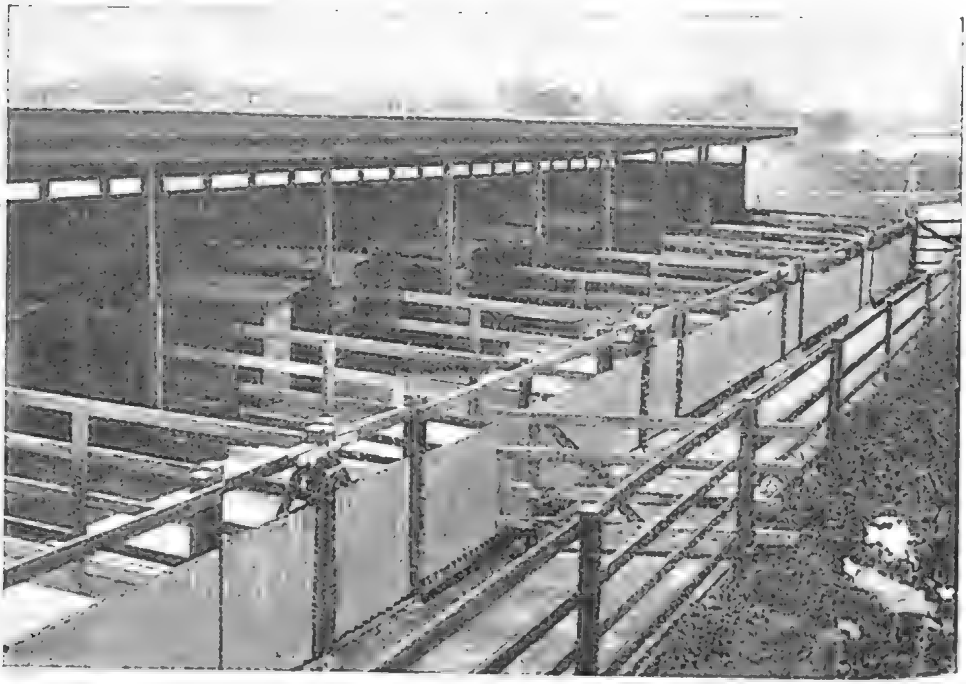


PLATE 95.—Piggeries at the Animal Health Station, Yeerongpilly.

Financial Aspect.

When considering the financial aspect of this work a number of factors must be considered, and many of these vary considerably, so that it is difficult to make an accurate estimate of the costs involved in raising pigs under this system of feeding. The one which varies most is that of food prices. For the purpose of this experiment they have been taken at market value over the period of the test. The cost of the ration used therefore has varied from ·75d. to ·83d. per lb., with an average cost of ·79d. per lb.

When determining the cost of production of porkers and baconers under this system of feeding, the following factors must be taken into consideration:—

(1) Capital value of breeding sows;
(2) Cost of feeding sows;
(3) Cost of buildings and equipment;
(4) Cost of feeding pigs from weaning to marketing;
(5) Labour costs.

Capital Value of Breeding Sows.—As the sow is purchased or reared to breeding age solely for the production of litters, the capital value of the sows must be debited to the litters reared during her breeding life. For purposes of costing, it is assumed that the purchase price of a sow at the time of carrying her first litter is £4 4s., and that an average sow with reasonable care, produces seven litters during her active breeding life with an average of eight pigs per litter. Each pig, therefore, bears a cost of 18d. towards the purchase price of the sow.

Cost of Feeding Sow.—The pigs in a litter also have to bear the feeding costs of the mother from the time of conception until the litter is weaned. Under this particular system of feeding the average cost of feeding one sow for this period was 525d. This cost, however, could be considerably reduced under ordinary farm conditions by keeping the sows in open paddocks, where grazing would provide a large proportion of the sow's food requirements. Each pig, therefore, bears a cost of 66d. for feeding the sow.

Cost of Buildings and Equipment.—The buildings and equipment used in this experiment are much more elaborate than is usually the case on most dairy farms. The depreciation cost on these buildings and equipment amounts to 10d. per pig.

Cost of Feeding Pigs from Weaning to Marketing.—The average cost of food for one pig from weaning to age of marketing in these experiments was £1 1s. 5d. This is based upon the results obtained from 104 pigs used in these experiments. (See Table 2.)

Labour Costs.—Using the hopper system of feeding, one man could handle 400 pigs per year. In comparison with standards applying on Queensland farms £150 per year would be considered suitable wages for a person thus employed in pig-raising.

Labour costs are therefore calculated at 7s. 6d. per pig. To the farmer raising pigs but not employing labour this figure represents additional profit.

The following table sums up the costs incurred in producing pigs in these experiments; these costs are the average results obtained from fifteen litters, representing 104 pigs, which include both porkers and baconers:—

Cost of Producing Carcass weighing 90 lb.—

	£	*s.*	*d.*
Capital value of sow	0	1	6
Feeding costs of sow	0	5	6
Cost of feeding pigs from weaning to marketing	1	1	5
Buildings and equipment	0	0	10
Labour	0	7	6
Total costs	£1	16	9

Average weight of carcass	=	90 lb.
Average value per lb. dressed weight ..	=	5·5d.
Average value received per pig ..	=	£2 1s. 4d.
Net profit per pig	=	4s. 7d.
or gross profit, excluding labour ..	=	12s. 1d.

Value of Maize when Fed in Combination with Other Foods.—Maize makes up a large part of the ration used in these experiments, and it is a food which is grown in practically all of the farming areas in Queensland. However, to economically market maize by feeding to pigs the price realised for the pigs must cover all the costs of producing the pigs, and, in addition, give a return for the maize which is higher than the ruling market price.

The rations fed in these experiments form a possible avenue for the profitable marketing of maize by feeding it to pigs. In order to determine whether this is so, the following tables have been prepared,

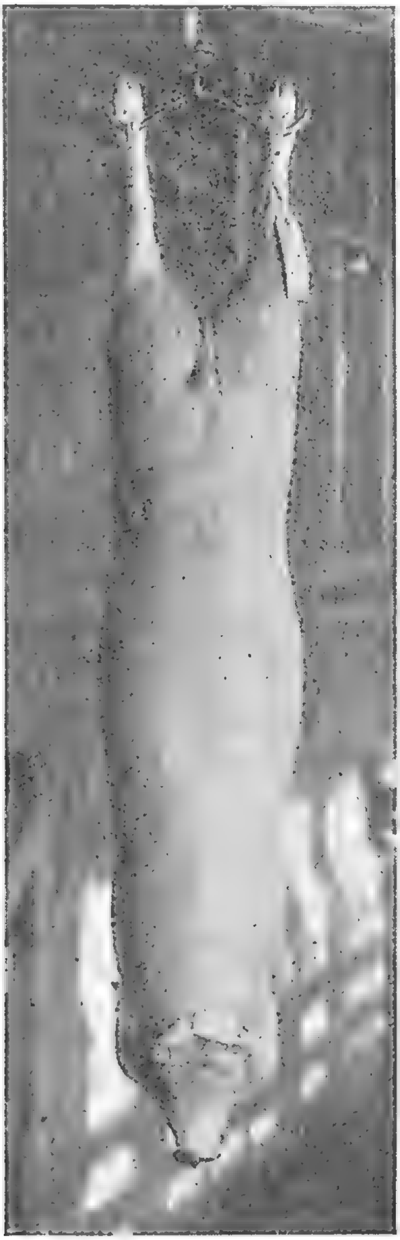


PLATE 96.—Illustrating export porker type of pig; white skinned, fine in the bone, lengthy, yet compact, and of desirable weight (70 lb. dressed). This is a Middle White grade type.

based upon the results obtained in these experimnts using both porkers and baconers.

Baconers.—465 lb. of food are required to produce a carcass weighing 121·5 lb. This amount of food is made up as follows:—

	s.	d.
209 lb. maize (value to be determined)		
186 lb. pollard at 6s. 6d. per 100 lb.	12	1
37 lb. meat meal at 10s. per 100 lb.	3	8
33 lb. lucerne chaff at 5s. per 100 lb.	1	8
Total food costs, excluding maize	17	5
Labour costs (est. on time employed per pig) ..	7	6
Cost of feeding sows (per pig)	5	6
Capital value of sow (per pig)	1	6
Buildings and equipment (per pig)	0	10
Total costs (excluding maize) of producing carcass weighing 121·5 lb.	£1 12	9

Bacon Prices.	Value of Carcass weighing 125·5 lb.	Net return representing value of 209 lb. Maize.	Value of Maize per Bushel.
	£ s. d.	£ s. d.	s. d.
6d. per lb.	3 0 9	1 8 0	7 6
5½d. per lb.	2 15 8	1 2 11	6 2
5d. per lb.	2 10 8	0 17 11	4 10
4½d. per lb.	2 5 7	0 12 10	3 1
4d. per lb.	2 0 6	0 7 9	2 1

Note.—In calculating the net return, which represents the value of the maize fed, the sum of £1 12s. 9d. (total costs, excluding maize) is subtracted from the value of the carcass.

The average price received for baconers for the period under review (1934) was 5d. per lb.; therefore, the maize fed to bacon pigs in these experiments returned 4s. 10d. per bushel after deducting all the costs incurred in the production of the pigs. The market value of maize during this period did not exceed 3s. per bushel.

Porkers.—255 lb. of food are required to produce a carcass weighing 74·2 lb. This amount is made up as follows:—

	s.	d.
115 lb. maize (value to be determined)		
102 lb. pollard at 6s. 6d. per 100 lb.	6	8
20 lb. meat meal at 10s. per 100 lb.	2	0
18 lb. lucerne chaff at 5s. per 100 lb.	0	11
Total food costs, excluding maize	9	7
Labour costs (est. on time employed per pig) ..	5	0
Cost of feeding sow (per pig)	5	6
Capital value of sow (per pig)	1	6
Buildings and equipment (per pig)	0	10
Total costs (excluding maize) of producing carcass weighing 74·2 lb.	£1 2	5

Pork Prices.	Value of Carcass weighing 74.2 lb.	Net return representing value of 115 lb. Maize.	Value of Maize per Bushel.
	£ s. d.	s. d.	s. d.
6½d. per lb.	2 0 2	17 9	8 8
6d. per lb.	1 17 1	14 8	7 2
5½d. per lb.	1 14 0	11 7	5 8
5d. per lb.	1 10 11	8 6	4 2
4½d. per lb.	1 7 10	5 5	2 8

Note.—In calculating the net return, which represents the value of maize fed, the sum of £1 2s. 5d. (total costs, excluding maize) is subtracted from the value of the carcass. The average price received for porkers for the period under review (1934) was 5½d. per lb., therefore the maize fed to porkers in these experiments returned 5s. 8d. per bushel after all costs had been deducted.

PLATE 97.—Export porkers of a lengthy class, medium in condition, reported upon as of an economical, fast-growing type suited to trade requirements. The progeny of a Large White boar mated to a Berkshire sow.

Quality of Carcasses.—These experiments have shown that pigs can be produced economically under this system of dry meal feeding. Apart from the financial aspect, however, it is necessary that only the best quality carcasses should be produced for the export trade. Reports received from the Queensland Meat Industry Board, and also from Swift and Co., Ltd., London, have shown that the type of carcass produced in these experiments is highly satisfactory for the export trade to the United Kingdom. In a report received from Swift and Co. regarding one shipment containing carcasses of the following types:—Tamworth x Large White, Berkshire x Tamworth, Berkshire x Large White, Large White Pure, Middle White-Tamworth x Middle White—the following statement was included:—

> "As a whole they were some of the finest developed pigs we have seen; percentage of fat and lean was generally well distributed and not wasteful. Handling throughout was all that could be desired."

All the pigs slaughtered from these tests were graded first export quality.

Disease.

Pigs reared under this system of housing and feeding were comparatively free from disease. A feature of note, however, was the fact that in practically every case the litters suffered a severe attack of diarrhœa

at ages varying from three to five weeks. The cause of these attacks was not definitely determined, but it was probably associated with a deficiency of iron and possibly copper.

This was substantiated by the fact that dosing the pigs in the litter with a solution containing sulphate of iron and copper sulphate was successful in stopping the trouble. This solution is made up as follows:—Sulphate of iron, 3¼ oz.; copper sulphate, ¾ oz.; warm water, 1 pint.

The copper sulphate and sulphate of iron are dissolved in the water, and 1 pint of treacle or molasses is added and the whole is mixed thoroughly. Treatment then consists in dosing the pigs in the litters with one teaspoonful of this mixture immediately the symptoms of diarrhœa are noticed.

This mixture is very successful for treating diarrhœa which is caused by a deficiency of iron and copper. The attacks of diarrhœa may be prevented by painting the udders of the sows once daily with the mixture from the time of farrowing until the litters are five weeks old.

From the experiment pigs, ten heads were condemned on slaughter due to abscess formation in the submaxillary glands. The causal organism was identified as *B. pyogenes.*

Conclusions.

1. These experiments have demonstrated that meat meal can be fed economically to pigs in a dry form in combination with cereal meals, minerals, greenstuff, and drinking water.

2. That the ration used is appetising, nourishing, and a good substitute for skim milk, buttermilk, or whey.

3. Meat meal fed pigs as produced in these experiments are of a very satisfactory carcass quality, comparing favourably with those produced where a maximum of milk is used.

4. During periods of short supply of skim milk meat meal could be used to supplement the milk to advantage, especially if fed in dry form with the meals used in these experiments. It is claimed, therefore, as a result of these feeding tests, that the addition of meat meal to ordinary farm rations, inclusive of a proportion of skim milk, would enable the available milk to be distributed over a larger number of pigs, thus enabling pig production to be increased without increase of dairy stock.

5. The two methods of feeding could be combined during periods when skim milk is available in larger quantities, the pigs being fed on milk and other foods until they are from thirteen to fifteen weeks of age, after which they could be given a meat meal ration similar to the one used in these tests until they are ready for marketing.

6. That the return to the farmer for maize fed in conjunction with meat meal to pork and bacon pigs is much higher than market values, provided the pigs are:—

(*a*) Fed correctly from birth to maturity.

(*b*) Are kept under sanitary conditions.

(*c*) That market values of pork and bacon pigs bear a similar ratio to that which has applied during the experiments.

REFERENCE.

W. A. Stewart, 1933: Prevention of Anæmia in Little Pigs by Feeding. Journal of Ministry of Agriculture, Vol. 39; p. 1155.

Breeding for Pork and Bacon.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising, and
L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

PIG-RAISERS are frequently confused in the matter of selecting the correct types and breeds of pigs to produce their baconers and porkers, and the object of these notes is to place before Queensland farmers something definite about the pig trade requirements and how they may be met by careful attention to the breeding of pigs.

The information herein is given after careful consideration of all the available evidence of breed tests and performances both here and abroad. It must be noted from the outset that, although the matter of "breed" is important, it is not nearly so important to the pig-raiser as the matter of individuality within the breed; also feeding and management of the pigs have a vast effect on their inherent characteristics.

During their growth pigs pass through a stage when they increase mostly in body frame, then at a later stage they increase in flesh and fat, and as they approach maturity they become very fat. The correct stage at which to market pigs for pork or bacon is when they have put on sufficient flesh and fat to give them a "finished" appearance, but before they carry an excess of fat. Some experience is necessary to be able to determine when a pig has reached this correct stage of maturity or fatness.

Full feeding and restricted exercise favour early fattening at a light weight, whereas limited feeding and grazing tend to retard fattening, though grazing does not necessarily retard growth. Some types of pigs fatten and mature at lighter weights than others.

Wherever one goes, he hears the question: "What is the best breed or cross of pigs " The answer at present is that, "There is no best breed or cross of pigs, but several breeds and crosses give satisfaction in that they meet the requirements of the farmer as well as the bacon curer, pork butcher, and the consumer." Firstly, one must consider the trade for which he intends to cater. The pork trade, the Queensland bacon trade, and the English bacon trade, all require the same conformation and proportion of fat and lean in the pig's carcass, but each of these trades requires the "finished" pig at a different weight. A description of the ideal carcass for any of these trades is as follows:—

A fleshy pig, with a comparatively light covering of fat; the flesh and fat being of fine texture and firm, and should harden under ordinary chilling treatment; in conformation, the pig should be comparatively light in the shoulders, neck and jowl, and head; the middle should be comparatively long and fairly deep with ribs well sprung, but not bulging into a rounded barrel; the back should be slightly arched, and the belly line straight but full to the flanks. The hams should be fleshy, well rounded, deep and broad. The skin and the legs bones should indicate fine quality.

The most desirable weights are—(*a*) For local and export porkers, 60-80 lb. dressed; (*b*) for Queensland baconers, 95-120 lb. dressed; and (*c*) for the English "Wiltshire Side" bacon trade heavier carcasses are required, pigs dressing 130-160 lb. usually realising highest price per pound.

It will now be realised that to have that desired degree of "finish" on a porker, a light baconer, or a heavy baconer, it is necessary to use breeding stock of types which mature early or late as desired.

Although there are variations in all breeds of pigs, we can, in a general way, class our breeds of pigs into two fairly distinct types, viz.:—(*a*) The smaller, quicker-maturing porker type, and (*b*) the larger, later-maturing bacon type.

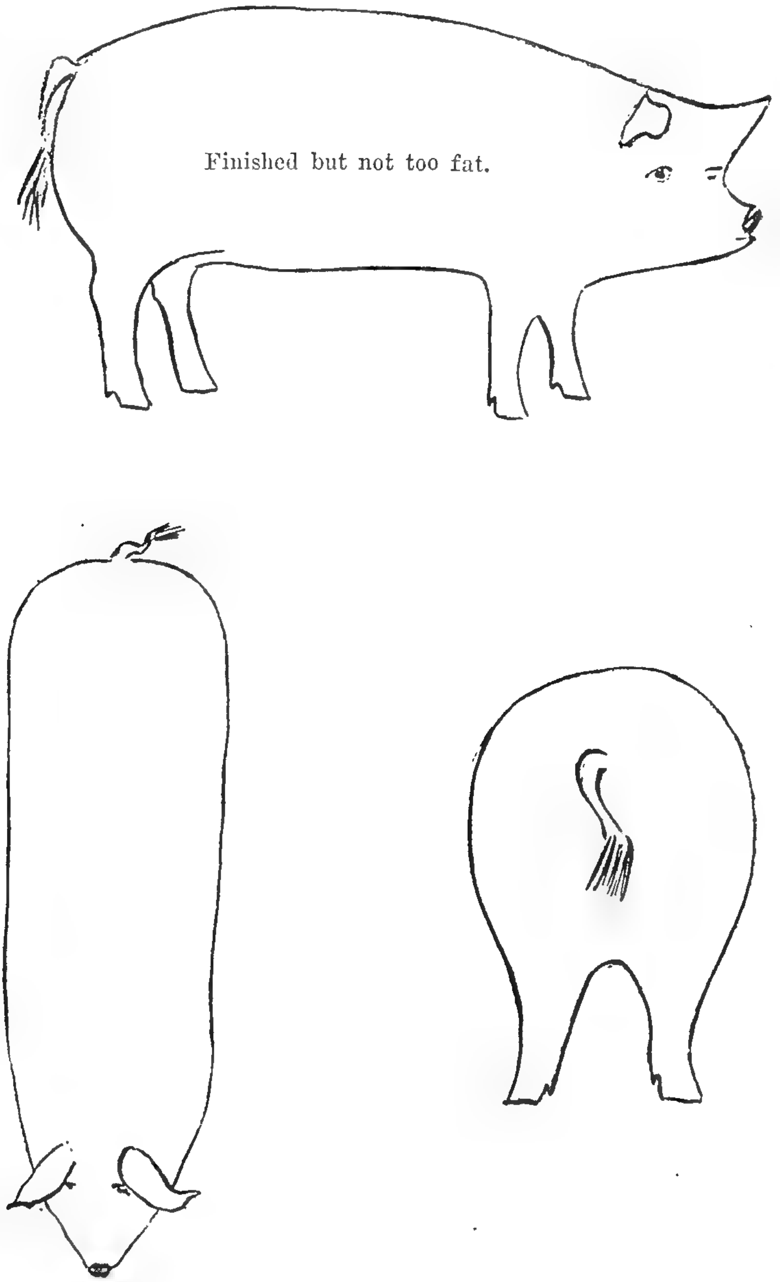
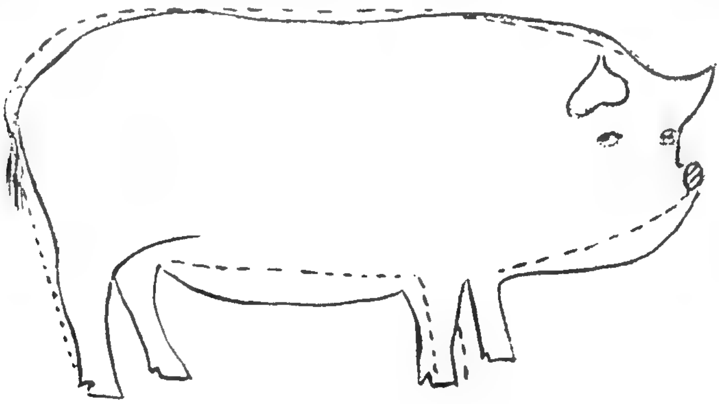
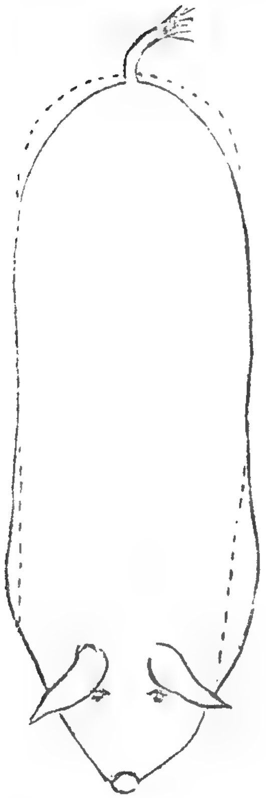


Plate 98.

Diagrams showing side, top, and rear views of a good type of pig carrying the required proportion of the most valuable parts of a carcass. The ideal conformation to be aimed at by the breeder of porkers and baconers.

Early maturity (with which is associated early fattening) must not be confused with fast growth, which may be found in either late or early maturing animals. Maturity means that the animal has finished its development, at which stage it usually fattens rapidly. Fast growth means that the animal grows rapidly, although it may not be fattening.





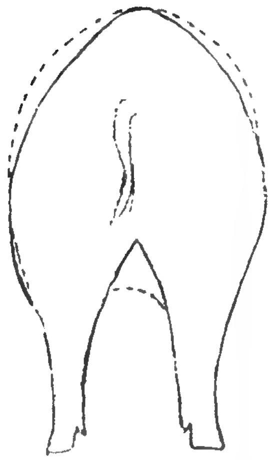


PLATE 99.

Diagrams showing side, top, and rear views of an undesirable type of pig. Comparison of heavy lines with dotted lines shows where this type departs from the ideal.

To have an abundance of lean meat it is necessary to have the animal growing rapidly, but not fattening; therefore, to produce the ideal pig which is in a "finished" condition, but not too fat, when it reaches the most desirable trade weights, and which has grown rapidly, it is necessary to use the correct class of breeding stock. For the production of light-weight porkers, the early-maturing breeds are quite satisfactory, but if this class of pig is grown on rapidly to either local or export bacon weights, it will give a thick and overfat carcass; this is a common mistake made by pig-raisers.

To produce the export baconer, the larger, late-maturing class of pig suits admirably, but if this class of pig is marketed at porker weights or at Queensland baconer weights, it is "unfinished," and does not give a meaty and attractive carcass.

A problem is presented by the Queensland bacon curers who require their "finished" pig at an inconvenient weight. The smaller class of pig, if used to produce bacon, must either be grown very slowly to baconer weights or give an overfat carcass, while the larger class of pig, if marketed at 95-120 lb., gives a very rangy carcass which is usually lacking "finish." So it is a medium class of pig which is required, and this class must be produced either by (i.) selective breeding of either the more lengthy pigs of the smaller class or the more compact pigs of the larger class; or (ii.) by crossing the pigs of the smaller type with pigs of the larger type.

Of the breeds in use in Queensland at present, the Berkshire and the Middle White are typical early-maturing pork breeds, while the Tamworth and Large White are typical late-maturing bacon breeds, although the Tamworth is a little more compact and earlier-maturing than the Large White.

Individual animals and families vary, but the more typical representatives of these breeds fit into these classes. It might be repeated here that selection of the most desirable individuals within each breed is even more important at times than the selection of a breed, as individuals vary to a great extent.

Where crossbred sows of medium type are in use on the farm, they should be mated with boars of the larger class for the production of baconers, and with boars of the smaller class for the production of porkers. When we speak of the smaller class of pig it is not meant to imply that a very small pig is desirable. From the pig-breeder's point of view, size of the individual within the breed is an important characteristic. A good-quality big pig is better than a good little pig.

The English pork and bacon markets and the local pork market have a preference for white pigs, and when these markets are being specially catered for the Middle White and Large White breeds—either as purebreds or for crossing—must receive consideration. The progeny of white pigs mostly are white, even if the one white parent is mated with a black or red animal. It might be mentioned with regard to white pigs that while they are reasonably hardy, their skin will soon become unhealthy if they are exposed to insanitary conditions or to parasites, such as lice and mange mites.

Using typical pigs of the breeds, under average conditions, the following breedings are giving desirable carcasses in their particular class:—For porkers 60 lb. to 80 lb. dressed—Middle White or Berkshire; for local baconers 95 lb. to 120 lb. dessed—Tamworth of compact type,

Large White X Middle White, or Large White X Berkshire; for export baconers 130 lb. to 160 lb. dressed—Large White.

The ideal porker or baconer can be pointed out when alive with a reasonable amount of accuracy, and for the breeder's purpose it is necessary that they should be discernible while alive.

While endeavouring to produce the ideal porker or baconer, the farmer must keep in mind points other than market requirements; these are prolificacy, rate of growth, and food consumption for each pound of pork produced.

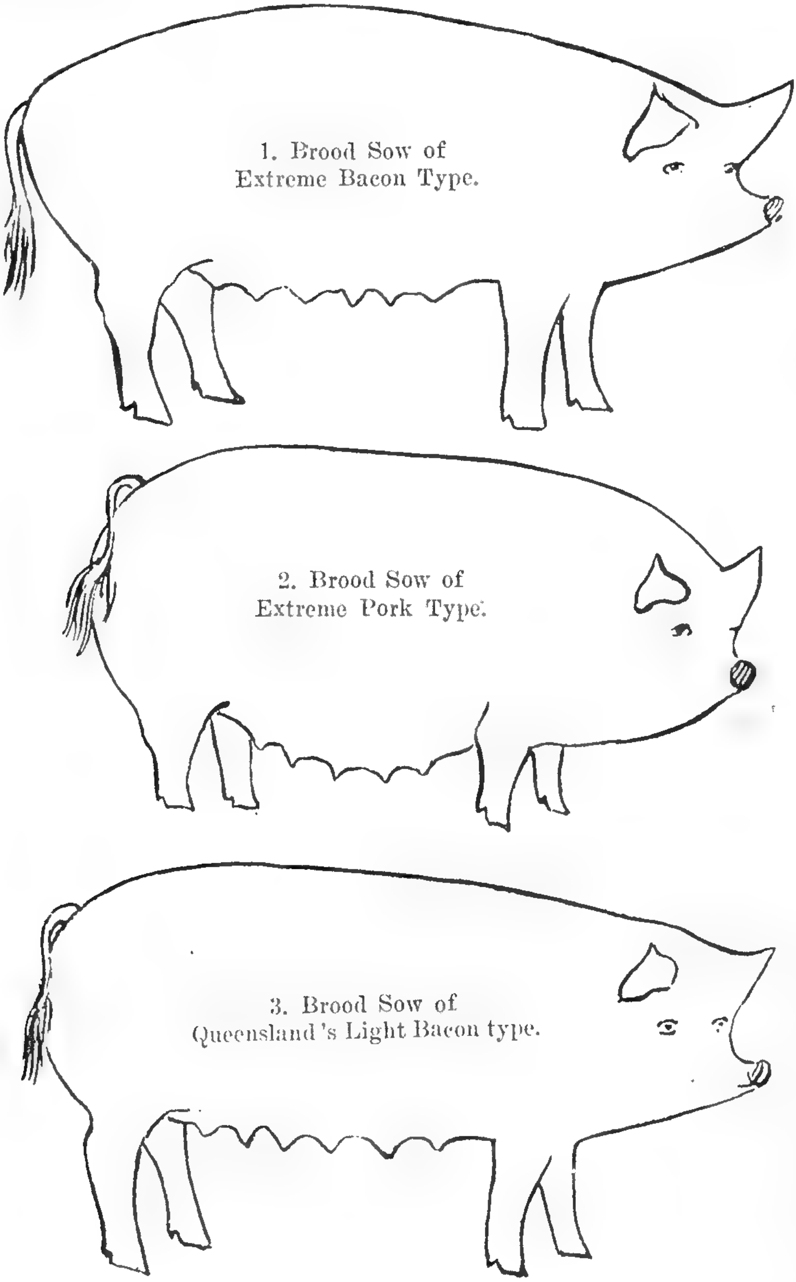


PLATE 100.

The above diagrams illustrate adult pigs of the larger and smaller types, as well as the medium type which suits the Queensland bacon trade.

Feeding Farm Animals.

By H. W. KERR.*

Introduction.

AT the Bundaberg Conference of the Technologists' Society a paper was read by Mr. G. E. Waddell on "Scientific Horse Feeding." An interesting discussion ensued, and it was evident that a wide diversity of opinion exists as to the feed requirements of the farm horse, and the manner in which a suitable ration may be supplied economically. At the request of several cane farmers, I have much pleasure in preparing a review of the proposals and recommendations presented by Mr. Waddell. First of all, however, it appears desirable to set out in a brief and elementary manner the fundamental principles of animal nutrition so as to provide a background for the discussion of an important subject which is all too imperfectly understood by farmers in general.

Composition of Feeds.

There is a very important point of distinction between the plant and the animal kingdoms. It is the function of the plant to build up carbonic acid gas, water, and the so-called plant-foods absorbed from the soil into the various complex tissues, in which process the sun's energy plays a most important part. The animal is entirely dependent, either directly or indirectly on these plant materials for its life functions. We must therefore understand the nature of plant materials, and the manner in which they are utilized in the animal body.

When the chemist analyses a feeding material, he subdivides its constituents into the following groups:—

(*a*) *Proteins*—or substances containing nitrogen;

(*b*) *Carbohydrates* embracing sugars, starches and fibre;

(*c*) *Fats,* and

(*d*) *Mineral substances* (so-called *ash*).

These groups of substances are known as *nutrients,* and each possesses its own peculiar properties and functions when taken into the digestive system of the animal.

Animal Nutrition.

The animal body consists essentially of a bony skeleton of mineral matter—largely phosphate of lime—surrounded by an elaborate muscular system. Fatty tissues permeate the bones and muscles, and around all is the enveloping skin. Within the body cavity are the various special organs, designed for dissolving, distributing and utilizing the nutritive matter of the food and for disposing of the waste. While the composition of the plant is predominately carbohydrate in nature, the animal body is thus largely built of proteins.

The changes which the food undergoes within the digestive tract of the animal is known as *digestion.* This process prepares the nutrients for absorption and use in building new tissues, repairing those which are broken down, and as a source of energy. Carbohydrates can only be absorbed by the animal body when they have been converted into

* In the "Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations).

simple sugars, and there are several digestive juices which act on the starches and more complex forms to reduce them to this simple state. Fats must be broken up during the digestive process and converted to a form in which they may be absorbed through the intestinal wall. Proteins are likewise reduced to simple, soluble compounds before they can be taken into the bloodstream and utilized; thus the relatively complex plant proteins are taken apart before they may be absorbed by the cells of the animal body and built up once again into complex animal proteins. The mineral matter is not substantially changed during digestion, but is merely brought into a soluble condition and thus absorbed.

Functions of the Nutrients.

The digested nutrients are transported by the circulating bloodstream for the nourishment of all parts of the body. They may then be "burned" to warm the animal—through the agency of oxygen absorbed by the lungs—or to produce energy for the performance of work. If more nutrients are supplied than are necessary for these purposes, the excess may be converted into body tissues, either protein or fat. The burning of the nutrients in the animal body produces carbonic acid gas which is eventually eliminated through the lungs; the waste nitrogenous products produced by the breaking down of protein material are excreted in the urine together with the surplus of mineral matter.

Digestibility of Feeds.

Now it is found that all feeds are not of equal value to the animal, by virtue of the fact that their nutrients are but partially digestible. The indigestible portion of the feed is represented by the fæces which have really never entered the animal body. The extent to which the different nutrients are digestible has been determined as the result of a large number of feeding trials, in which the total amount of nutrient fed to the animal is compared with that which is voided in the fæces. The following list provides the results obtained from a selection of common feed materials in which the canegrower will be interested; the figures in brackets denote the percentage of digestible matter in each ingredient:—

Feeding Stuff.	Water.	Protein.	Carbohydrates.		Fat.	Dry Matter—Digestible.
			Fibre.	Sugars, Starches, &c.		
	%	%	%	%	%	%
Concentrates—						
Oats	9	12 (78)	11 (35)	60 (81)	4 (87)	70
Maize	11	10 (74)	2 (57)	71 (94)	5 (93)	90
Bran	10	16 (78)	10 (31)	54 (72)	4 (68)	65
Linseed meal ..	9	34 (89)	8 (57)	36 (78)	8 (89)	79
Molasses	25	3 (32)	Nil	60 (90)	Nil	78
Roughages—						
Oat hay	12	8 (54)	28 (52)	42 (56)	3 (61)	54
Oat straw	12	4 (28)	36 (60)	41 (51)	2 (39)	54
Lucerne hay ..	9	15 (71)	28 (43)	37 (72)	2 (38)	60
Cane tops	68	2 (54)	10 (59)	17 (75)	..	69
Young grass, 6 in.	70	5 (70)	6 (60)	14 (78)	1 (60)	..
Mature grass (Paspalum)	85	2	4	8	..	..

This list has been subdivided for convenience into two classes of feed—(*a*) *Concentrates*, which are low in fibre and contain a large proportion of digestible nutrients; and (*b*) *Roughages*, which are the coarser feeding stuffs, high in fibre and supplying a lower percentage of digestible matter. In practice it is customary to blend a proportion of each class to provide a ration which supplies bulk as well as the essential nutrients in the required proportions.

Feed Requirements of the Horse.

The following are regarded as the minimum nutrient requirements of the horse:—

Horse.	Per day per 1,000 lb. live weight.			
	Dry Matter.	Digestible Protein.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	
Idle	13–18	0·8–1·0	7–9	8·0–9·0
At light work	15–20	1·0–1·2	9–11	8·0–8·5
At medium work	16–21	1·2–1·5	11–13	7·8–8·3
At heavy work	18–22	1·5–1·8	13–15	7·6–8·1

It will be observed that the total quantity of nutrients required depends on the nature of the work which the animal is performing. Moreover, it will be seen that the "Nutritive Ratio" varies accordingly. This ratio is simply the relationship between the weights of digestible carbohydrates and fats (energy material) to digestible proteins. With increased exertion, there is also an increase in the rate at which the body tissues are broken down and a consequent heavier demand on proteins to repair these tissues.

In determining a suitable combination of feeding stuffs to provide the farm animal with its requrements, several important considerations demand attention. The horse is limited in its capacity to consume roughage, and in general some concentrate must be added to the ration to supplement the deficiencies of the coarse fodder. The nature of the concentrate added will be governed by the nature of the digestible nutrients available in the roughage. And finally, the farmer will wish to purchase those concentrates which supply the desired nutrients at the lowest unit cost. It will be observed that in these discussions the use of maize or oats, or linseed meal as concentrate, is considered only in its ability to supply econmically the desired nutrients and not because of any special virtue which each possesses. This is a point on which prejudice often obscures the farmer's better judgment.

A study of the list of feeding stuffs given above brings out the following interesting points:—

(1) Maize has the highest percentage of digestible nutrients of all feeds listed: 90 per cent. of the total material is actually digestible. It will be observed, however, that its nutrients are chiefly starches and fats, and it is notably deficient in proteins; in this respect it does not compare favourably with lucerne hay, which is 50 per cent. richer in this nutrient.

(2) Comparing lucerne hay* with oaten hay*, it will be seen that they are essentially equivalent in the proportion of digestible carbohydrates, but lucerne hay will supply almost twice as much digestible

* Generally spoken of as "chaff."

protein as will the oaten hay. This suggests that lucerne might well be used in preference to oaten hay, with advantage to both the farmer's pocket and the animal.

(3) Molasses is a concentrate rich in carbohydrates (sugars) and containing but a small proportion of digestible proteins.

(4) Cane tops ("chop") provide good average roughage, with but little digestible protein and fair carbohydrate value. It does not compare favourably with young pasture with respect to digestible proteins, though it is decidedly superior in every particular to mature dry grass.

(5) Linseed meal is found to be a particularly useful concentrate where it is necessary to supply substantial amounts of protein to provide a balanced ration, thugh it must not be used excessively. One pound per day is regarded as a suitable addition. It is also rich in digestible carbohydrates and fats.

Determining the Ration.

In calculating a satisfactory ration it is best to begin with the amounts of the several nutrients which the horse obtains from the roughage available to it. It will be evident that a horse pastured on young grass will require different supplementary feed from one fed on chop or old pasture; while a horse in full work demands an all-round increase in nutrients over that for one at light work, as shown in the table given above. Consider, for example, a 1,300 lb. horse at regular ploughing work. Suppose it consumes 8 lb. of good quality young grass at night, and receives a daily ration of 8 lb. maize and 14 lb. chaff. The available nutrients in this total feed and the corresponding minimum requirements are:—

Feeding Stuffs.	Dry Matter.	Digestible Proteins.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	
Maize, 8 lb.	7·2	0·6	6·9	1 to 10
Chaff, 14 lb.	12·4	0·1	6·4	1 to 45
Young grass, 8 lb.	2·4	0·3	1·6	1 to 5
Total	22·0	1·0	14·9	1 to 13
Minimum requirements	23·4	2·0	16·9	1 to 8

It is evident then, that the animal is getting too little dry matter and total digestible nutrients, while the high nutritive ratio shows that the ration contains too little digestible protein. This could be adjusted by the addition of a proportion of linseed meal and by substituting some feed richer in protein (lucerne hay) for a proportion of the maize.

For a farmer who is feeding 20 lb. chop and 8 lb. molasses, and allowing his animals to graze out at night on rank paspalum pasture, the daily ration would be somewhat as follows:—

Feeding Stuffs.	Dry Matter.	Digestible Proteins.	Total Digestible Nutrients	Nutritive Ratio.
	Lb,	Lb.	Lb.	
Chop, 20 lb.	6·4	0·23	4·1	1 to 17
Molasses, 8 lb.	6·0	0·08	4·4	1 to 54
Rank grass, 16 lb.	2·4	0·18	1·6	1 to 8
Total	14·8	0·49	10·1	1 to 20
Minimum requirements	23·4	2·0	16·9	1 to 8

In this instance it is again evident that the animal at hard work is receiving a ration deficient in every detail and demanding an increase in protein-rich feed particularly. Failing this the horse must inevitably lose condition.

Molasses as a Feed.

The preceding example must not be interpreted as a condemnation of molasses as a feed. On the contrary when correctly used it is one of the cheapest concentrates available to the canegrower, but it is to be regarded essentially as an "energy" food, and requires balancing with appropriate amounts of protein-rich concentrates. When used in this manner with the proper proportion of roughage, an excellent ration may be compounded.

In this connection a report recently received from Louisiana lays particular emphasis on that very point. Feeding trials have been conducted in that state over a number of years, with farm mules, and it has been demonstrated clearly that molasses will replace ground maize in a highly satisfactory manner. (It was pointed out earlier that the value of maize lay chiefly in its carbohydrate content, which accounts for the interchangeability of these two feeds.) It was determined that animals could be given up to 9 lb. of molasses daily without apparent detriment to the animal; 6 to 7 lb. was, however, considered the most satisfactory allowance. Experience showed that it was best to add the undiluted molasses to the roughage just before feeding.

Typical rations fed to mules in Louisiana plantations are as follows:—

1.	2.
15 lb. ground maize.	7 lb. dried brewers grains.
8 lb. soy-bean hay.	7 lb. cracked maize.
7 lb. molasses.	2 lb. cotton seed meal.
	7 lb. soy-bean hay.
	7 lb. molasses.

Soybean hay and cotton-seed meal could be substituted by lucerne hay and linseed meal.

Mineral Nutrients.

In conclusion, a few comments should be made on the question of the mineral constituents of feed. It is a well recognised fact that an animal must receive its due proportion of minerals—notably phosphate and lime—to maintain it in a healthy condition, and enable it to build the necessary bone and muscle. It is also highly significant that the pastures of our heavy rainfall areas are markedly deficient in the essential minerals. This is a matter requiring investigation, and in all probability it will be found to be related to the shorter useful lfe of draught animals in North Queensland.

Several well-established licks supplying the essential minerals are now marketed in Queensland, and their use is well worthy of consideration by farmers in these parts.

Drought Feeding of Stock.

IN order that useful data may be gathered in connection with the drought feeding of stock, stock inspectors in the affected districts were asked to report on the following points:—

1. How severely the district was affected.
2. Fodders in use during the dry spell, including licks.
3. Quantities of feed used during specified period.
4. Numbers of stock fed.
5. Methods of feeding adopted.
6. Classes of stock fed, especially breeding stock; and in the case of lambing ewes, what proportion of lambs was saved.
7. Approximate daily cost per animal.
8. Water supply.
9. General results achieved.

In connection with 2 and 3, it was desired to ascertain the approximate quantity of dry Mitchell grass or other natural grasses available in the different localities in which green feeding was practised, and also the edible shrubs which were considered most useful.

STOCK INSPECTORS' REPORTS.

Hughenden District.

The District Stock Inspector, Hughenden District (Mr. R. W. Bambrick) reported—

Speaking generally, the drought culminating in July last was not considered any worse than that of 1926. From Hughenden eastwards, very slight losses were sustained. The downs country suffered the heaviest losses both during the dry spell and from the effects of the rain after it.

The stock foods chiefly used during the dry time were—Lucerne hay, maize, Meggitt's meal, and Thorpe's kubettes, and the licks Vita-lick, Vic-lic, and licks made up on the properties from several of the following ingredients in various proportions:—Dicalcic phosphate, Nauru phosphate, bone meal, salt, sulphur, Epsom salts, gentian, molasses.

Quantities of feed used during a specified time would approximate 3 oz. to 4 oz. maize or ½ lb. lucerne hay or 4 oz. Meggitt's meal or 4 oz. kubettes daily. Lick is usually supplied in troughs and sheep would take up to 2 oz. daily.

The feed was spread out on clay pans or gravelly ridges mainly, except in the case of rams where trough feeding was resorted to.

In most instances, where hand feeding was adopted (in addition to ram feeding), the best of the ewes and the young sheep were fed; except where it was thought advisable to maintain woolly sheep up to the time of shearing. Practically all young lambs were lost, and a big percentage of old ewes in lamb.

The approximate cost of hand feeding was sixpence (6d.) per head per month.

The water on most sheep properties in this district is supplied by artesian or sub-artesian bores. In the case of artesian bores, the water

is run along drains through the property. With sub-artesian bores it is pumped by windmill or engine, stored in earth tanks or galvanised iron tanks, and supplied to stock in troughs.

Losses have varied. In some instances, sheep were hand fed and kept alive until rains fell only to perish from wet and exposure afterwards.

Close to Hughenden losses were negligible, but on places to the west and south-west losses from 10 per cent. to 90 per cent. were sustained. It is estimated that over the whole district there was a loss of 25 per cent. of the flocks due solely to starvation.

A few properties which were not overstocked carried small quantities of dry Mitchell and Flinders grass, but due to dry conditions and after the slight falls of rain, the grasses rotted and were not of much use as sheep feed. One case is cited: A property near Corfield carried a fair body of dry Mitchell grass and the sheep on it, which were not hand fed, were rapidly losing condition after May. The shrubs utilised for feeding and considered most useful were whitewood, vine tree, mimosa, and boree.

Many stock owners considered it inadvisable to hand feed, for with the lower sheep values and the uncertainty of rain until summer, the cost of hand feeding would have placed an unrealisable value on the sheep that survived.

Rockhampton District.

The District Stock Inspector at Rockhampton (Mr. J. J. Ashe) reported that stock feeding during the dry time was confined to the dairy herds of local milk vendors.

Emerald and Springsure Districts.

The District Stock Inspector at Emerald (Mr. D. Hardy) reported:—

Emerald and Springsure districts were practically unaffected by the drought. Over 200,000 sheep were agisted in the Emerald and Springsure districts during the dry period from December, 1934, to the end of July, 1935. Of that number, 80,000 came from Wellshot, Ilfracombe, and Longreach.

Since the rains at the end of June and first week in July most of these sheep have returned to their home pastures, all in very fair condition and, in most cases, very much improved in condition. No fodders were used, the sheep being fed on the natural herbage and shrubs in the paddocks where agisted.

Various licks were in ordinary use, including Vic-lic and various mixtures made up of salt, molasses, sulphur, &c.

Plentiful supplies of water in streams and bores were available throughout the period.

The sheep were maintained in a satisfactory condition during the seven months of agistment, and were able to truck away in strong and healthy condition.

The sheep were depastured on Mitchell, Flinders, and Blue grass chiefly; edible shrubs fed included wilga, currant bush, and yellowwood.

The average price paid for agistment was £20 per 1,000 sheep per month.

Longreach District.

The District Inspector of Stock (Mr. C. G. Barth) reported—

It will be noticed from the records given below that the weather has been particularly dry in the Longreach district since the commencement of the year 1934.

Rainfall.—

1932	19·43 in.
1933	21·29 in.
1934	8·48 in.
1935 (January to June)	5·31 in.

From January of this year until the last week in June only 1·88 inches of rain was recorded, the remainder—3·43 inches—fell during the last week in June.

Prior to the rain at the end of June this year the only feed that remained in many places was a few old burnt-up grass tussocks and the leaves which fell from withered trees.

With the exception of a few permanent waterholes along the Thompson, Barcoo, and Diamantina Rivers, the surface water had entirely disappeared, and artesian and sub-artesian water was all that was available to stock.

From January until July of this year stock routes were untrafficable, and owners sending their stock to relief country were obliged to resort to hand feeding between their holdings and the nearest railway; and in many cases water had to be arranged for at some of the stations contiguous to the stock routes.

The Longreach and Winton districts are rather unfortunate in not having a reserve of good edible shrubs for dry times, and where edible shrubs were available, even in small quantities, they were used successfully with a ration of maize, and the cost of feeding was, consequently, reduced considerably.

Several owners of flocks up to 20,000 sheep were compelled to cart water in 1,000-gallon tanks on motor trucks for many miles daily, as the water in their dams had dried up. These trucks were engaged exclusively on this work for many months.

During the last six months, the trees, particularly those on the lighter and sandy soils, were dying as a result of the drought; and on the black soil plains huge fissures could be seen everywhere.

Owing to the prolonged dry spell it was impossible for cattle from the Territory and districts in the North-west to travel south through the Central-west.

In normal seasons the stock routes down the Diamantina and Georgina country are used extensively by thousands of cattle travelling south each year between the months of April and October.

To further indicate how severely the district was affected during the recent dry spell, I submit the following summary (approximate) of the sheep position:—

Longreach District—

20 per cent. sold.

40 per cent. sent away to agistment country.

15 per cent. fed by hand distribution of cultivated and manufactured fodders.

25 per cent. died.

Winton District—

15 per cent. sold.

25 per cent. sent away to agistment country.

10 per cent. fed by hand distribution of cultivated and manufactured fodders.

50 per cent. died.

On some of the holdings in the Winton district 85 to 90 per cent. of the sheep died, but I estimate the average for that district to be 50 per cent. mortality.

The very high mortality among the sheep in the Winton district occurred during the week the rain fell, and was due to the sheep having been recently shorn, the boggy nature of the country, and the cold spell. Under the conditions it was impossible to feed the sheep after the rain commenced, and the majority died from starvation and exposure.

In numerous cases throughout the Central-west, sheep with six months' and more wool, were shorn and turned out in the paddocks to die.

Fodders in use during the drought, including licks.

Lucerne hay, lucerne chaff, oaten hay, oaten chaff, maize, Thorpe's kubettes, Meggitt's nuts, bone meal, Vita lick D, Prophylactic sheep lick, Dalco, Epsom salts, coarse salt.

A few dry butts of Mitchell grass were available on some of the holdings, from which the stock could obtain a certain amount of roughage.

On other places, edible shrubs such as boree, whitewood, dead finish, supple jack, mimosa, leopard tree, and sandalwood or plum tree, were available as roughage; and this fodder, when used in conjunction with a ration of maize, proved to be satisfactory. Mulga, of course, is a superior fodder to any of the abovementioned trees or shrubs, but, unfortunately, there is very little of this in the district; whilst gidgee, of which there are immense quantities, is not regarded as a satisfactory fodder for stock.

Most of the selections and stations in the Longreach district have open downs country, and are without edible scrubs. Owing to the prolonged dry spell they were denuded completely of dry grass and roughage of any kind; and it was on these places where the sheep carrying six months or more wool were shorn during the cold weather, and turned out into the bare paddocks to die.

Quantities of feed used during specified period.

The most satisfactory way to answer this question would be to give details of a few specified cases of hand feeding in the district. In that connection, I submit particulars of what was done on Luthrie, Portland Downs, and Breedon statians to feed flocks during the recent dry spell.

Luthrie Station.

101 bags maize, from 1st May, 1935, to 24th May, 1935.

671 bags maize, from 24th May, 1935, to 14th July, 1935.

A fair quantity of old dry Mitchell grass and other roughage was available on this place, otherwise the cost of feeding would have been much greater.

Portland Downs.

564 tons maize, 268 tons lucerne hay, 21 tons oaten chaff, 9 tons oaten hay, 20 tons salt, 3 tons Vita lick, 3 tons Meggitt's nuts, 6 cwt. bone meal, 4 cwt. Epsom salts.

The sheep in varying numbers were being fed from 4th February, 1935, until 31st July, 1935.

A fair quantity of dry Mitchell grass and boree scrub was available.

Breedon Station.

17 tons lucerne hay, 3 tons maize, 1 ton Thorpe's kubettes, 1½ ton Vita lick. The total cost was £234 16s.

A fair quantity of Mitchell roughage was available, and this reduced the cost of feeding considerably.

Numbers of stock fed.

Luthrie Station.

6,000 sheep, from 1st to 24th May, 1935.

12,000 sheep, from 24th May until 14th July, 1935.

Portland Downs.

Commenced feeding 6,507 ewes, lambs, and rams on 4th February, 1935. By 23rd July, 1935, the numbers fed increased to 62,000 mixed sheep, and diminished to 29,000 by the end of July, 1935.

There are about 100,000 sheep on this station, therefore about 40,000 sheep were not fed.

Breedon Station.

130 rams, 600 ewes.

In addition, 6,000 sheep were away on agistment country, costing £166 12s. 8d. per month.

Methods of feeding adopted.

With the exception of chaff and the various licks, the feed was scattered broadcast from motor trucks on to clay pans and hard ridges. The licks and chaff were generally fed in wooden troughs or on bagging stretched along two plain wires.

Classes of stock fed, especially breeding stock, and in the case of lambing ewes, what proportion of lambs was saved?

Luthrie Station.

6,000 breeding ewes, 2 to 7 years.

1,500 maiden ewes.

150 rams.

Balance of sheep are mixed weaners.

This station was fortunate in not having their ewes lambing during the dry period.

Portland Downs.

37,000 ewes, from 2 years.

23,000 weaners, 6 months to 1 year.

2,000 rams.

No ewes lambed during the last six months, but the drop previous to that did very well on hand feeding, with very few losses.

Breedon.

There were 180 lambs, December-January drop, with 600 ewes, and out of these lambs only 35 were saved; although well fed, the lambs died off.

Generally, I estimate that not more than 5 per cent. of the lambs in this portion of the district were saved during the last six months.

Approximate daily cost per animal.

Luthrie.

·250d., including distribution costs and licks, based on the following prices of feed:—Maize, 3s. 6d. per bushel; railage, 1s. 2d. per bushel; cartage, 6d. per bushel; distribution, 10d. per bushel. Total, 6s. per bushel.

Feed cost this station £600 and licks £100.

Portland Downs.

With roughage, maize ration, and lick, only ·357d. per head per day.

With lucerne hay, maize, and licks, 1·000d., and from 1d. to 3d. per day for rams.

Lucerne hay delivered at Portland cost about £11 15s. 4d. per ton, maize, £12 5s. per ton.

Breedon.

Including distribution costs—1·000d. per head per day, rams costing up to 3d. per day.

Water supply.

Artesian and sub-artesian.

General results achieved.

Luthrie.

Feeding was commenced early while the sheep were in fairly strong condition, with the result that only 70 died.

With the maize ration in addition to the dry Mitchell grass and other roughage, the sheep were in fair store condition at the end of the dry period. The owners are quite satisfied with the results of their feeding.

Portland Downs.

On this station the owners commenced feeding before the sheep lost too much condition, with the result that they held their condition. Over 2,000 good-quality stud rams were fed right through the drought with excellent results. The losses on this place amounted to about 5 per cent., which is regarded as very satisfactory.

Breedon.

The quantity of cultivated and manufactured fodders given was just about sufficient to keep the sheep in strong condition, and they had a certain quantity of dry Mitchell roughage which helped considerably.

Despite the feeding and attention given, sheep carrying six months' wool died during the cold rain which followed the dry spell; and, during the last six months, this station lost quite a big percentage of its sheep.

Roma District.

The District Inspector of Stock (Mr. E. S. Cardell) reports:—

The Roma district, generally speaking, was not affected very severely during the dry season.

Fodders in use were lucerne—chaff and hay—maize, molasses, Master and Vita licks. In a few isolated places, wheaten hay and Soudan grass hay were used.

Only small quantities of cultivated and manufactured fodders were used during the dry season.

Only small flocks were fed.

The methods of feeding adopted were mostly by trough. There were a few exceptions of scrub feeding.

Classes of stock fed were lambing ewes, lambs, and dairy cattle. I have heard of only a small percentage of lambs being lost in the district.

The graziers interviewed had kept no record of the approximate daily cost per animal.

Water supply was getting short in a number of places. Creeks, lagoons and wells were drying up very quickly.

The general results achieved were not unsatisfactory for the drought was only beginning to be felt when the rain came. Very little Mitchell grass was available in the district.

After the rains in the early part of the year, various grasses grew which carried the graziers and others through until recently, when shrub feeding—supple jack, mulga, wilga, ironwood, coolibah, apple-tree red ash, myrtle, womal, and wild peach—had to be resorted to in some places.

CAUSES OF "SCOURS" IN CALVES.

Carelessness, impatience, and indifference on the part of the feeder spells failure in calf-rearing. The greatest cause of loss amongst calves is "scours," and more often than not is due to negligence.

Scours may be caused by—

Allowing very young calves to eat material which affects digestion.

Feeding skim-milk too soon to young calves.

Feeding milk at too low or too high a temperature.

Irregular rations.

Feeding separator froth with milk.

Overfeeding.

Impatience when feeding so that the calf is not allowed to take its time. The calf consequently goes out hungry and drinks water.

Feeding meal to a calf at too young a stage.

Overfeeding with meal.

Feeding undercooked meal.

Feeding soured milk.

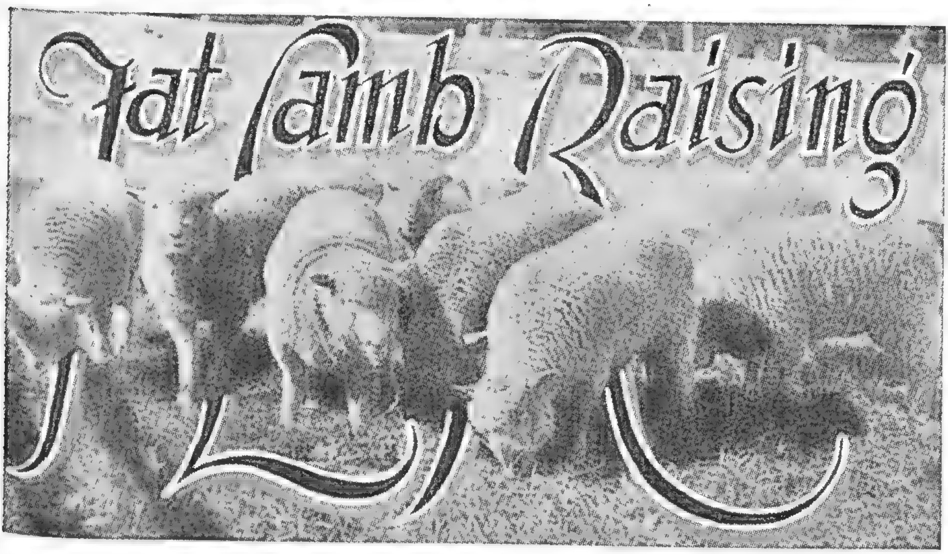
Feeding from dirty utensils.

Allowing calves to drink from stagnant water, sewerage water, or water from dirty troughs.

Dirty or infected shed and yards.

Exposure to rain and weather.

Allowing calves to chew old rags, twine, and other rubbish.



FAT LAMBS—SIX "DON'TS."

THE SIX BIG "DON'TS" IN THE HANDLING OF LAMBS ARE:

DON'T overdrive the lambs.
DON'T use dogs that bite.
DON'T grab the animals roughly by the wool.
DON'T prod with sticks, or ill-use in any other way.
DON'T overcrowd in trucks.
DON'T allow the animals to fall off the gangboards during unloading operations.

Owners, agents, drovers, abattoir employees, and railwaymen are asked to co-operate in an earnest endeavour to prevent these and any other injurious practices.

Bruises or lacerations impair the market value of the finished carcass, and result in its rejection for export.

Better handling means better prices—better trade and—better reputation.

SHEARING AND SHEARERS.

By JAS. CAREW, Senior Instructor in Sheep and Wool.

IN view of the fact that sheep shearing by machinery has been practised in Australia for upwards of half a century, the following letter taken from the "Farm, Field, and Fireside" (England) of 5th July, 1935, reads rather quaintly:—

MECHANISED SHEEP SHEARING.

To the Editor of "F., F., & F."

Sir,—For the first time, the sheep in Hyde Park have this year been sheared by machinery, and as I have the grazing rights in the Royal Parks, I am being besieged with questions about hand-shearing and machine-shearing. As the subject will be of considerable interest to your readers, perhaps you will allow me to say a word about it.

I watched the mechanical shearing with the closest attention, and in spite of the bad weather conditions the shearers had to contend with most of the day, I am satisfied that is was better done than it could have been done by hand, and very much more quickly.

In the past I have always had my sheep shorn by hand, but, so convinced am I that mechanical sheep-shearing is the method of the future, that I have decided to have all my sheep sheared by machinery in future, and I believe that my friends will do the same.

In my opinion, this modern method of shearing is invaluable for the large and small flocks in Scotland and Wales, as flock owners have to depend so much upon the weather. Undoubtedly this form of shearing has come to stay.—Yours faithfully,

G. DALE WILLIAMS.

At the Shepherd's Hut, Royal Parks, London, W.2.

In Australia the shearing of sheep advanced in keeping with the numbers of sheep. A hundred years ago there were about 1,000,000 sheep in Australia; to-day there are well over 100,000,000.

During the time this increase was taking place there was a large spread to remote areas, and each flock had to be shepherded. When shearing time came round, the owner arranged to have his sheep shorn at some suitable place, usually near a good water supply. It was quite a common practice before shearing to wash the sheep in a pool and then turn them into a clean, well-grassed paddock to dry. The sheep were then packed together overnight to cause the yolk to rise in the wool, which made it easier to cut. Shearing was paid for at per 100 sheep. The first price I remember was £1 per 100. All other labour was paid at a weekly rate, with rations. As the flocks increased and spread further inland, shearers had to travel long distances on horseback to secure work. Groups of horsemen would commence a journey of 300 or 400 miles with the intention of getting a good "run" of sheds. The rouseabouts, or shed hands who provide the unskilled labour at shearing time, would probably start three months before shearing in order to foot the distance—the ownership of horses, pack and saddle, was generally beyond their means. In fact, many shearers started in this way.

The blades were in universal use half a century ago, but since then machines have replaced them in every shed in which an appreciable number of sheep is shorn.

The system of payment was a great incentive to shear as many as possible per day, with the result that fast work was the chief aim of the shearer. The early type of sheep lent themselves to fast work, for their wool was fine, fairly open, with very little covering over the points.

The old positions for holding the sheep were discarded and new methods adopted, and when a number of shearers using the shears got going, the click, click, click of the blades as they came together set up a rhythm which seemed to engender vitality and generate energy applied with amazing skill which resulted ultimately in world's shearing records being established. One hundred sheep per day extending over the shearing was regarded as a good performance, but these figures were exceeded

by fast men until some wonderful records were established—as, for instance, that of Jacky Howe, who shore 336 sheep in nine and a-half hours.

The conditions under which he established this record were favourable to him, as the sheep were picked "rosellas," but he actually did shear that number in the one day. This record was established at about the time the machines were coming in favour, and, needless to say, many of the crack machine-men made attempts to beat it.

One thing stands against fresh records, and that is that the size of the sheep has increased, and the average quantity of wool per fleece also. Nevertheless, the average sheep shorn per man per day is greater now than when the blades were used. Much prejudice prevailed against the machines, and, in fact, there are many who still maintain that the blades are better as they do not interfere with the growth of wool. The machines are reputed to deter the growth of wool, and although more wool is usually shorn off a sheep with the machines they cause a certain amount of tension of the skin, which takes time to return to normal, thereby causing a loss in growth for a week or more.

The heat of the machines also is blamed for causing skin trouble and retarding the growth of wool, but if they are in good order and in the hands of qualified shearers there is not likely to be any trouble. They pass over the skin so quickly that if in good cutting order it is impossible for any harm to occur.

The social changes that have taken place since the introduction of the machines are very marked. Fifty years ago the different watering places for hundreds of miles were known to the travelling shearers, and every "sheep barber" had the Australian Light Horsemen's love of his steed. Long days of travel were undertaken, and many tales were told around the camp fires of the wonderful endurance of the respective hacks, and of the points of the sires that produced the big-hearted stayers. After the sheds cut out, shearers' races were organised, and a few "specials" were always kept dark for the big events, for many well-bred horses were selected and kept for the purpose.

To-day the motor car has taken the place of the horse, and the shearer, no longer the picturesque figure of old, instead of shearing for the station owner, works for a contractor who agrees to shear the station wool, class the clip, and prepare it for market. Shearers arrange with a contractor usually to shear for a whole season. Their living quarters must be in accordance with a prescribed standard; their beds must be fitted with suitable mattresses; and the galley must be furnished and fitted to suit the cook, usually an expert at his calling.

Shearers are highly skilled tradesmen, athletic in proportion and stamina, and when they have changed from the "Jacky Howe" sleeveless flannel shirts and "beaver moles" of their working day there is nothing to distinguish them from the well-clothed, well-nourished, and well-read city man of moderate prosperity. The day of the "billabonger" has gone. The fires at the end of the recognised daily stages from water to water no longer give a twinkling welcome to the late comer on to camp. The "editor" of the "Billabong Gazette" has told his last lie and published his last "mulga wire." There is now no rest period of camping along the bore drain or under the coolibahs on the river banks waiting for the shed to start. The modern shearer arrives

on the job from his home town by car with suitcases instead of a swag. In Western Queensland, he sometimes journeys to the job by aeroplane, travelling by the regular mail flyers. His contract price for shearing is 32s. a 100, and taking into consideration the seasonal nature of his employment, distances of travel and cost of transport, and uncertainty of a continuous run for any lengthy period, he is not overpaid.

Shearing Records.

Until about 1880 it was rarely that 100 sheep per day were shorn. "Flash" Boyd was the first to shear that number in a day of nine hours with the blades. The best tally legitimately shorn is that of Jacky Howe when he did 321 with the blades at Alice Downs, in the Blackall district, in nine hours. This tally has never been beaten, either with the blades or the machines under similar conditions. Other big tallies were reported to be put up by D. Cooper (318 with the machines at Ballenbullock, Hughenden) and Jim Power (318 at Northampton Downs). Many men have shorn 200 sheep per day and over, including P. Palmer, who did 250 per day at Mount Abundance, Roma, in 1907, where he shore 30 sheep in one hour. At Nive Downs he did one sheep per minute for a short run. The great tallies of to-day show that, regarding speed, the shearers now do many more in a daily tally than, say, thirty years ago. Fred Zimmerle and Harry Livingstone were probably the best shearers (quantity and quality) in Queensland, which means best in Australia. R. Lynn is among the "gun" shearers of later days.

WOOL CLASSING—A COMPARISON.

By J. L. HODGE, Instructor in Sheep and Wool.

ESTIMATE of a clip from 10,000 sheep (merino) classed properly at present-day prices. Estimate of 25 bales (of 300 lb. average) to the 1,000 sheep—250 bales. For purposes of this estimate, no notice was taken of sexes, and no lambs included.

It is to be understood that the fleeces are free. It is a good clip and will average over the price obtained per lb. for the whole sale. 166⅔ fleece wool, 25 broken, 24⅓ pieces, 10 bellies, 12 stains, 12 locks; bales 250. Classed as follows:—

Class.	Number of Bales.	Price per lb.	Nearest £. Value per Bale.	Total.
		d.	£ s. d.	£ s. d.
AAA W (or E)	31	14½	18 2 6	561 17 6
AA W (or E)	46⅔	13	16 5 0	758 6 8
A W (or E)	29	11½	14 7 6	414 17 6
AAA Combing W (or E)	33	13½	16 12 6	548 2 6
AA Combing W (or E)	27	12	15 0 0	405 0 0
Broken W (or E)	25	12½	15 12 6	380 12 6
Pieces W (or E)	24⅓	10½	13 2 6	319 8 4
Bellies W (or E)	10	9	11 5 0	112 10 0
Stains W (or E)	12	6	7 10 0	90 0 0
Locks W (or E)	12	3½	4 7 6	52 10 0
	250	..	..	£3,643 5 0

Estimate of a clip from 10,000 sheep (merino) classed indifferently at present-day prices.

Class.	Number of Bales.	Price per lb.	Value per Bale.	Total.
		d.	£ s. d.	£ s. d.
AAA W (or E)	64	13½	16 12 6	1,064 0 0
AA W (or E)	73⅔	12	15 0 0	1,100 0 0
AW (or E)	34	10½	13 2 6	446 5 0
Broken W (or E)	20	11	13 15 0	275 0 0
Pieces W (or E)	20	9½	11 17 6	237 10 0
Bellies W (or E)	11	7	8 15 0	96 5 0
Stains W (or E)	13⅓	6	7 10 0	100 0 0
Locks W (or E)	14	3½	4 7 6	61 5 0
	250	..	..	£3,380 5 0

Note.—AAA combing W (or E) and AA combing W (or E) is strong wool which in the first place was taken out as shown. Here it is left in AAA W and AA W (or E), thereby depreciating the prices to the levels they brought when taken out.

A W badly skirted therefore goes up 5 bales in number, but loses 1d. per lb.

Broken has been picked badly and loses both in number of bales and price per lb.

Pieces treated carelessly, some wool going to stains to the loss of pieces; but no gain to stains.

Bellies unskirted or done badly, lose 1d. per lb.

Stains gain at the expense of pieces (a more valuable wool) in weight but not in price.

Locks become heavier as the result of carelessness and want of supervision on the part of the classer, but the price received is no greater, thus losing the difference between stain prices and locks for every pound gained in weight.

——	Bales.	Lb.	Value.	Difference.
			£ s. d.	£ s. d.
Clip—well classed	250	75,000	3,643 5 0	263 0 0
Clip—classed indifferently ..	250	75,000	3,380 5 0	..

Price per lb. No. 1 clip, 11½·6d.

Price per lb. No. 1 clip 10¾·2d.

I have thought it well for purposes of illustration to take a well-classed clip as against one got up indifferently.

The figures work out well for the purpose for which they are intended. For instance, it would be quite easy to reduce the amounts obtained for clip No. 2 to almost any figure in reason, but here I have shown distinctly the loss entailed (not in an unclassed clip) in a clip classed but done indifferently in comparison with the same clip handled properly.

I might mention that I have been more than fair in the figures quoted to the indifferently classed clip.

THE NECESSITY FOR CULLING AND ITS ADVANTAGES.

By J. L. HODGE, Instructor in Sheep and Wool.

WHEN one comes to consider the position of pre-eminence in the world to which the Australian merino sheep has achieved, one is forced to think further of the importance of selection; and, after all, what is present day culling if not the selection of the best of a flock for a certain combination of conditions as applying to certain types and districts.

Like everything else on the land the proposition resolves itself into what is profitable and what is not economic. If I put the question to an interested listener, "Why feed an unprofitable sheep?" there is no satisfactory reply to be expected. A bad sheep eats just as much as a good one, but the economic position goes further than that, inasmuch as a bad ewe reproduces her kind, or more probably still produces a lamb worse even than herself.

It should be recognised then that the operation of culling is definitely profitable to the grazier. Elaborate yards are not necessary on a small holding for culling operations. A branding race or something resembling one is quite sufficient for the purpose. Culling should take place in the case of the ewes when the latter are carrying from nine to twelve months' wool. Some sheep classers refuse to handle sheep unless they are full fleeced, but I think a man of experience may discriminate in the case of flock sheep when the fleece is three parts grown. The nearer ewe hoggets are to full growth the better.

The type of sheep to aim for necessarily differs in different districts, but viewing the subject generally and as applied to Queensland it should be the object of the grazier to retain sheep answering to the following qualifications. Constitution is of paramount importance. A live dog is better than a dead lion, and in this State of ours it is the considered opinion of all those who count in the industry that we will always have with us, more or less, conditions of drought in some portion of the State, if not the whole. It is necessary then to go for an animal well able to stand up to hard conditions, travel to water and in some measure retain its condition under adverse circumstances. The type of sheep most likely to achieve these objects is the large-framed, medium to strong woolled variety. Australia is a huge pastoral country and there is ample room in which to breed the finer types. These should be sought after in districts where drought is practically unknown.

After constitution comes the covering and all that it means. Density, length of staple, colour, and wool counts are all of the utmost importance. By wool counts we mean the fineness or coarseness of the fibre. A 64 may be regarded as a true medium, and it is a sheep of this quality to which I would advise growers to give special attention. Length of staple has an important bearing on prices and density definitely makes for a heavier fleece. Colour lends attraction to the fleece. Conformation must not be lost sight of.

Culling is not sufficiently practised in Queensland. Some stations cull annually and sheep classers are instructed to take out as much as 33 per cent. year after year. In these cases, of course, numbers permit of this being done, but the smaller grower cannot always afford this heavy culling. It should be the object of the grazier to fix a type

suitable to his district and conditions generally. Of the utmost importance is the choice of this type. Amongst the ewe flocks and the ewe hogget flocks everything should be rejected which does not come up to this standard. Being not true to type, malformation of any sort, unevenness in the fleece, lack of length in the staple, over strength in the covering, possibly ultra-fineness, want of size, delicacy of constitution, are all reasons for the rejection of an individual from a flock from which it is intended to breed.

No domesticated animal known responds so quickly to careful selection and mating as the sheep, when in the hands of a man who knows his business. There is also no shorter cut to increased returns than in the elimination of the unprofitable sheep and the retention of the better animal. It is unfortunately a common practice for graziers to sell their cull ewes as breeders. In the case of heavy station culling, as before referred to, no great harm may be done, as the numbers operated on and the percentage taken out are so great that a fair line of ewes may be purchased. In the case, however, of the smaller grower the practice is not to be recommended. It is therefore the wish of this Department to see such culls fattened and sent to market. A remunerative figure should be received by the owner and the industry benefited by the absence of the rejects.

A great many of the benefits to be derived from culling the ewes are lost unless hand in hand with this operation goes the purchase of better rams. It is a very short-sighted policy to quibble at a guinea or so in the price of rams. Provided the grower knows what he wants and has the necessary experience to select his rams, there is no greater economy than the extra money spent in the purchase of better sires. Should the grazier have doubts with regard to his ability to perform the useful work, he would be well advised to pay a recognised authority to select the type of ram suitable to the ewes proposed to be mated with them.

A medium ewe of about 64^s quality has been advocated, but it must be remembered that, in the west of Queensland, to maintain this type, a ram of slightly stronger fibre must be found. With western climatic conditions and possible droughty conditions there is always the tendency for a flock to fine up. This especially applies to the breeding flock. On the other hand, a lush season has a tendency to broaden the fibre.

Having taken out the culls, look after your breeders in the matter of feeding. No greater mistake can be made than in overstocking. All the sheep are affected with a possible loss of a pound of wool per head apart altogether from the further loss sustained in fat stock. Over a period of years it will be found that two sheep well fed will return more than three half-starved animals. There is an old saying that "half the breeding goes down the neck." This is only half a truth, for the reason that it does not pay to feed any ill-bred animal, but provided the blood is there, the saying may be taken as a trueism.

The State average of wool cut per head is, according to the last figures available, 7.7 lb. per head. This is something to be pround of, but at the same time, if systematic culling became universal and a yearly operation on all properties, there is no reason to doubt but that the average would be raised 1 lb. per head over comparatively few years.

This yearly increase in production would, of course, be brought about as much by the introduction of better rams as by the culling of

the ewes, and once more to touch on the economy in purchasing better rams, imagine 1 lb. of wool per head and its value over the whole flock as against the small additional outlay in the price of the rams.

Judged from every point of view, culling the ewe flocks systematically, and the introduction of better rams, has everything in its favour, and nothing against it. A palpable mistake is frequently made in an estimation of the value of a flock from which a clip comes, inasmuch as a grazier will quote price per lb. received. Price per head is the true estimate of what a flock is worth and when in addition to that is added the fact that the flock averaging the price per head is better fitted constitutionally to stand up against the irregularities of our seasons, there should be no doubt in graziers' minds as to the most profitable sheep.

I advise you then to cull and keep on culling, and as part of the endeavour to improve the flocks, to purchase better rams.

FARMERS' WOOL SCHEME.

In reply to the request of several correspondents, particulars of the Farmers' Wool Scheme administered by the Department of Agriculture and Stock are given below.

1. The Minister for Agriculture and Stock is prepared to assist woolgrowers to obtain the best prices for the wool from—

- (*a*) Holdings of less than 1,500 merino sheep;
- (*b*) Wool from crossbred and British breeds from any holding;
- (*c*) Bags and butts from any holding;
- (*d*) Star lots from our present selling agents.

The wool is received for classification and placed on the market to best advantage for sale.

2. A correct account of the wool is kept and each woolgrower is paid the amount received, less the broker's and other charges, which are as follows:—

- (*a*) A charge of 10s. per bale for classification. (This charge also includes insurance in sheds, on rail, transit to selling broker's stores.)
- (*b*) All freight, cartage, handling, broker's charges, bale account, &c.

3. The Department of Agriculture and Stock charges no commission. An advance of 60 per cent., free of interest, is made on the estimated value of the wool as at the time of its receipt in the Department's store. The freedom from interest on the advance does not apply to wool from crossbred and British breeds and bags and butts from holdings of more than 1,500 sheep.

4. The wool is sold as soon as possible, following a sufficient accumulation to enable its being sold to best advantage.

5. The weights as taken in the departmental store and the classification before sale are to be accepted as final.

6. Woolgrowers desiring to take advantage of this arrangement should notify the Under Secretary, Department of Agriculture and Stock, when consigning wool, advice of which, with all particulars, should be given.

7. Consign the wool to the Under Secretary, Department of Agriculture and Stock, Roma Street.

Recommendations.

(*a*) The bales should be branded with initials and numbers on the top only so that the same pack, if in good order, may be used again. This saves the price of a new pack to the grower.

(*b*) All merino wool should be kept separate from other grades and breeds.

(*c*) Locks and belly wool should be kept separate.

(*d*) Remove all dags and wet stains before rolling the fleece. The wool requires no other treatment on the farm.

Sale of Wool.

The wool is sold under the departmental brand—DA in diamond, thus—

DA

as soon as possible by wool brokers in rotation as arranged by the Department of Agriculture and Stock.

POINTS FOR POULTRYMEN.

When feeding for egg production one should remember that there are two definite objects to be kept in view. The first is keeping up the hen's body, and that in a good and fit condition, and the second is to give food that will yield the necessary materials to form the egg, and that in sufficient quantity to provide for the egg over and above what is needed for the body. Nature teaches that the body will first supply its own needs before commencing the work of making the egg. Materials needed for making are protein or nitrogenous matter, fat, water, and mineral matter, including carbonate of lime for shell-making. The quality of the food supplied has a great deal to do with the maintenance of health, which is a first consideration. Sufficient quantity of food may be given, but if it is not of the best quality it may fail in its results. The fat in the food (10 per cent.) will be supplied in wheat, in oats, and other grains. The protein, of which there must be about 14 per cent., may be supplied in meat, meat scraps, meat meal, fish meal, and in milk. Mineral elements are given in shell, limestone, grit, and salt. Green vegetable matter is also useful in this respect. Water should be supplied in abundance, for of this there is 65 per cent. in the egg, and the supply should be clean and frequently renewed. Not only is mineral food needed for shell formation, the minerals of the hen's body must be maintained as well, and, besides this food is a great aid to the digestion and assimilation of all the nutrients. One can hardly overdo the supply.

WEATHER conditions in the agricultural areas are far from satisfactory, as very little beneficial rain has been received since the early July falls. At the time of writing light rain is falling in the coastal areas which will benefit growing crops, but much heavier falls are required to facilitate the sowing of spring crops. The Darling Downs and the South-west are in need of good soaking rains, as these districts did not benefit greatly from the mid-winter falls.

Sugar.

All cane areas experienced cool dry conditions during the month of August. As a consequence, the 1935 crop made little if any growth, while the young plant cane was also handicapped. In the Bundaberg area the cane planted in March last has been damaged on several occasions by frosts.

Crops in all areas are cutting out below estimated yields, although the sugar content is uniformly satisfactory.

Maize.

The recent crop has met with a good demand at remunerative prices, and in view of the great extent of land available for the production of maize a heavy spring and summer sowing can be anticipated. The value of maize as a stock food is becoming increasingly recognised, and a larger proportion of the grain is likely to be consumed on the farm, as is practised in the United States of America, where it is marketed "on the hoof." In recent months large stocks of maize have been railed to the western pastoral areas in preference to the bulkier hay and chaff, and it is certain that such grain will play a big part in any scheme of drought mitigation in the future.

Difficulty is often experienced in keeping maize varieties true to type, owing to cross-fertilization, particularly in the closer settled districts, where a neighbouring crop may be tasselling at the same time. Considerable improvement can be effected by close selection to the type desired, and the sowing of a small seed plot every year. Such a plot can be sown a fortnight or so earlier than the main crop or can be placed in the middle of a field sown to the same variety.

Plate 101.—Rich Dairy Lands, Pinbarren Valley, near North Coast, Queensland.

Plate 102.—On a Beenleigh Farm, South Queensland.

Although an ear-to-row test is the only accurate method of determining high-yielding strains, much can be done by simple selection, and it is certain that the variety deteriorates in yield and quality if such selection is not carried out. Heavy mature ears, true to type and containing sound plump grain, should be looked for. A good husk covering is also important, while the general field characteristics of the plant should not be lost sight of. Field officers of the Department of Agriculture and Stock select seed maize of certain approved varieties, but it is obviously impracticable to meet the demand for such seed throughout the State, and orders are therefore limited to one bushel of each variety stocked. However, advice on seed selection can always be obtained on application to the Department.

PLATE 103.—ILLAWARRAS ON BUSH PASTURES, KIN KIN, GYMPIE DISTRICT, SOUTH QUEENSLAND.

Wheat.

Severe frosts and westerly winds have had a serious effect on young wheat crops, and as the reserves of subsoil moisture are very low, rain is now urgently required. Such rain would entirely alter the situation, as the wheat plant is hardy and possessed of remarkable recuperative powers. Many forward crops have been grazed as a precautionary measure.

Cotton.

The harvesting of the 1934-35 cotton crop is about completed, 14,326 bales of lint having been ginned to the 26th August, with a probable total of 14,500 bales being obtained for the season.

The good rains in July have allowed of the satisfactory preparation of the seedbed for the coming crop, and all districts report operations well forward, except in the South Burnett and Southern districts, where soaking rains are badly required.

Seed applications are being received at a steady rate, the total acreage being substantially ahead of comparable dates of last season.

Not only are many of the growers of this past season increasing their acreages, but a large number of farmers who either have not grown cotton before or have not had any for several seasons, are applying for seed. Although only moderate yields were obtained in many of the cotton districts this past season, the returns from cotton compared more than favourably with those realised from other crops, and farmers are becoming convinced that cotton-growing should play an important part in the cropping programme in all the districts where this crop can be grown successfully.

Plate 104.—In the Logan Valley, near Beenleigh, South Queensland.

General.

As a result of bad weather conditions affecting the potato crop in Victoria and Tasmania, prices have remained firm in all States. Southern Queensland potato crops show a tendency to increase in yield and quality and find a ready outlet in the North. As there is a possibility of a Sydney trade also developing during periods of shortage in Southern States, growers will need to pay particular attention to grading and bagging, as sound, uniformly graded tubers of good size are required.

With the advent of warmer weather weed growth will be in evidence, and cultivating implements will be in greater demand. The importance of this work to check weed growth and conserve moisture cannot be over emphasised.

Land which has received careful preparation during the winter will be in the best condition for the sowing of spring crops.

Tobacco seedlings will now be making their appearance in the seed-beds of the Texas, Yelarbon, and Inglewood districts, where early sowing is the rule. As plants are usually six to eight weeks old before being planted out in the field, such planting will not be general until October and November.

SOME TROPICAL FRUITS.

1. THE MANGOSTEEN.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE mangosteen belongs to the natural order *guttiferæ* and is one of the two hundred odd species of the genus *garcinia*, its specific name being *G. mangostana*.

It may be described as a small tree with deep-green, glistening foliage. The leaves are thick, leathery, and large—6 to 10 inches long—elliptic oblong in shape. The flowers are polygamous.

Its native home is the Malay Peninsula, and it is reported as being a common tree in the gardens of the East Indies and the Philippines. It is, however, a notoriously difficult tree to establish outside its native habitat, consequently it is little known in Queensland.

Many attempts have been made to introduce the mangosteen into Australian cultivation, but practically all have ended in failure. As early as 1854 seed of this fruit was introduced and propagated in Southern Queensland and New South Wales, but although seedlings were raised then and on numerous subsequent occasions, no record can be traced of any of them having reached maturity.

The first recorded success was with trees raised at the Kamerunga nursery, near Cairns. A number of fruit were imported from Java to this institution in October of 1891, and from the seed obtained a number of seedlings were raised. However, they proved to be very delicate and the then manager of the nursery reported from time to time that their growth was very slow and many were killed out when the temperature dropped to 40 deg. to 45 deg. F. When sixteen months old several were transplanted into the field and were then only 4½ inches high. When approximately eight years old these trees were only 18 inches to 2 feet high.

Under its native conditions the mangosteen bears its first crop at eight to ten years of age. Comparison with the Kamerunga trees at

about the same age will show how intolerant it is towards foreign conditions. With the example of the Kamerunga trees it is not to be wondered at that the earlier attempts to acclimatise the mangosteen in Southern Queensland and New South Wales proved failures.

By about 1907 only one tree out of all those raised at Kamerunga remained. In 1910 special attentions to the tree were instituted, mulch, water, and liquid manure being applied at intervals. In 1913, twenty-one and a-half years after planting, the treatment was rewarded by the production of a crop of fruit. So far as is known this was the first tree to produce a crop of the fruit in Queensland.

A short time later the Kamerunga Station was closed down, but the tenant of the land since that time reports that the tree continued to bear fruit every second or third year until 1929, when an effort was made to move it to another side and, most unfortunately, it died.

Besides the trees grown at Kamerunga several (one dozen in all) were distributed to private persons between 1891 and 1895, but no trace of them can now be found, so one must conclude they all perished.

About the year 1900, however, two trees were planted at Mossman, and these still survive. The largest of these is now about 12 feet high and carries small crops. There is no record as to when the tree commenced bearing, nor as to the size or regularity of the crops. This year's crop was four fruit only. The tree carries the distinction of being the only recorded bearing tree in Queensland at the present time. The second tree is much smaller and apparently has not cropped, at least during the last two years.

In addition to these two trees, two young ones (seven years and two years old respectively) are growing at Mossman, and one five years old at Cairns. It is quite probable that a few other trees exist in Queensland, but these are the only ones known.

Description of the Fruit.

A short description of the fruit—called the "Queen of Fruits" and the "finest fruit in the world" by some of its early discoverers—would be appropriate.

The mangosteen is of the shape and size of an apple, 2½ to 3 inches in diameter, slightly flattened between the stalk and apex. The skin is smooth, thick, and somewhat leathery, deep-red to reddish-purple when ripe, with occasional spots of orange-yellow juice which has exuded from a skin injury and hardened on the surface. The bright-green sepals are retained on the stem and encircle the base of the fruit, whilst the apex of the fruit permanently retains the stigmata. On encircling the skin of the fruit with a sharp knife the apex may be lifted off, disclosing several snow white "quarters," varying from five to seven, filling the red-purple cup. The segments are of the shape and size of those of a mandarin, and their texture has been truly compared to that of a well-ripened plum. The flavour is delicious. The only drawback is that the fruit contains a comparatively small amount of pulp for its size.

In regard to the cultivation of the mangosteen, all authorities concur in the need of a wet but well-drained loam for its successful growth. High atmospheric humidity does not appear to be essential, but a reasonably high temperature is required. Temperatures much below 50 deg. F. appear to be definitely harmful, particularly to young trees.

One of the greatest contributing factors towards the difficulty in establishing the mangosteen is probably the paucity of root development. Working on to roots of hardier and more robust species may overcome this trouble. In America experimental work has been carried out with several species, and some promising results have been obtained. Probably at least one out of the two hundred odd members of the genus will be found suitable for the purpose, then possibly the mangosteen will be met with in Queensland more frequently than it is at the present time.

An introduced allied species has very frequently been mistakenly called the mangosteen in Queensland. This is the Cochin-goraka (*G. xanthochymus*). It is a much hardier variety of *garcinia* than the mangosteen, and was acclimatised here with very little difficulty. Quite a number of these trees are to be seen in North Queensland, scattered here and there in ones and twos. Under favourable conditions they grow strongly and carry heavy crops of fruit. The trees usually assume a conical form, the branches growing almost parallel with the ground and radiating from a central stem. The leaves are long, glossy, and pendulous. The fruit is borne in clusters on the smaller branches, is a bright glossy green when young, and golden-yellow when ripe, and about 2½ inches in diameter. The apex is pointed and the axis of the fruit is usually offset from the centre. The skin is thinner and softer than that of the mangosteen, but on being encircled with a knife the same formation of pulp is observed. In this case, however, the segments are yellow—just a shade lighter than the skin. The flavour is distinctly acid, although the degree of acidity varies in different seedlings, leading one to surmise that a good variety of the fruit could probably be bred.

F. M. Bailey lists three species of *Garcinia* as being indigenous to Queensland, viz., *G. mestoni*, *G. warrenii*, and *G. cherryi*. The first of these finds its native habitat on the slopes of the Bellenden Ker range at an altitude of about 2,000 feet. Its fruit are similar in shape and characteristics to *G. mangostana*, but vary a good deal in size from 2 inches upwards, sometimes being larger than the mangosteen. Its colour, skin, and flavour resemble *G. xanthochymus*.

The habitat of the other two indigenous varieties is given as the Coen district. No description of fruit of *G. warrenii* is given in Bailey's "Queensland Flora," but he describes *G. cherryi* as having yellow, oval fruit 1½ inches long and slightly exceeding 1 inch in diameter. F. J. Cherry, who discovered it and after whom it is named, remarks about it that "it does not taste badly, and birds and insects are very fond of it."

PRESERVING ORANGE JUICE.

USE only glass, porcelain, tin-coated (not galvanised or zinc-coated) or aluminium vessels.

Cut the oranges in halves and extract the juice. (A glass cone is suitable for small quantities.)

Strain the juice to separate seeds and coarse pulp from the juice.

Have bottles thoroughly clean and scalded; fill them to within 1½ inches of the top, and cork.

Place bottles on their sides on the false bottom of a boiler and cover with water. Heat the water to 175 deg. to 185 deg. Fahr. for thirty minutes, and regulate the flame to keep the temperature below 185 deg.

Remove the bottles and set aside to cool, away from cool draughts of air.

PRESERVING LEMON JUICE.

THE juice as it is squeezed from the fruit is allowed to remain for twenty-four hours until a sediment collects at the bottom of the vessel. Then the clear liquid is decanted and reduced by heat to one-third of its volume—i.e., three quarts of juice would be reduced to one quart. The heating process should not be done by direct fire, but by standing the vessel containing the juice in a copper or some larger vessel over the fire. On a large scale a water bath or steam circulating in a jacket boiler could be used. In any case, the vessel in which the juice is heated should be enamelled.

The juice may be sweetened by adding from 4 to 5 lb. of sugar for every gallon of juice before it is reduced by heat. It is bottled when cool, but before bottling it may require straining or filtering.

To prevent deterioration by mould the bottles, which are filled to within an inch from the cork (which is then tied down), are placed standing in a flat-bottomed boiler. Water is placed in the boiler up to an inch from the necks of the bottles, and then heated by direct fire up to 170 deg. Fahr., and kept at that temperature for about twenty-five minutes. Then they are removed and laid on one side, never standing. To prevent breaking of the bottles it would be well to have a false perforated bottom placed in the boiler.

The method of keeping fresh juice, as used in the various Navies, is to add 10 per cent. of brandy, that is to say, 1 gallon of brandy to 9 of juice after it has been heated.

FRUIT MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

Packing Houses.

ATTENTION is again drawn to cleaning up the packing house, sizing plant, and boxes used in the orchard and sheds. Odd days to spare through inclement weather and other reasons can be well used for building many useful home-made accessories to the packing house. "Packing Houses and Their Equipment," free on application to the Under Secretary, Department of Agriculture and Stock, explains how to make many useful things.

Apples.

Growers with apples in cold storage would be well advised to make frequent inspections, and to start marketing regular consignments. Granny Smiths are realising up to 12s. per case, Democrats 9s. to 12s.

Citrus Fruits.

Oranges are firmer in price, good lines realising—Navels 8s. to 9s., Commons to 7s.; small fruit hard of sale. Mandarins are now beginning

to show signs of becoming puffy, a condition which is reflected in the wide discrepancy in the highest and lowest prices, Emperors realising 4s. to 12s., Scarlets 4s. to 10s., Glens 5s. to 12s., the solid Ellendale variety 10s. to 15s. Growers in the northern districts should watch their fruit closely now to avoid placing dry and puffy fruit on the market. The weather as I write these notes (the last week of August) is still showery. This will have the tendency to spoil the keeping quality of the citrus. This season citrus has all kept in much better condition, due to the dry autumn and winter. The display at the Royal National Exhibition was the best we have seen for quality and kept well during the whole of the Exhibition.

Good cured lemons are selling well. The best cured lines have touched 12s. Curing is simple and greatly enhances the keeping quality and attractiveness of the lemon.

Bananas.

Prices for bananas still leave much to be desired. Some packs are coming to hand rather slack, others showing signs of bad sizing. The dry cold winter has not allowed the fruit to fill out in many cases, making it hard for growers to market good-looking, well-filled fruit. Close attention to sizing—in taking care to keep the standard of length a high one—will assist in minimising the lack of girth and angular appearance of the fruit. Prices, 5s. to 10s. 3d. for top-grade lines.

Tomatoes.

Coloured fruit still sells better than green lines. Coloured 4s. to 7s., green 3s. to 4s., with special to 5s. Whilst the cool weather continues growers would do well to leave the Break o' Day variety to fully mature and show signs of colour before harvesting. This variety is a good carrier, ripening slowly and firmly. Traces of blight have been found in some lines the last few days, due possibly to the wet humid conditions prevailing the last week.

Packing-shed equipment is one of the least studied things with tomato-growers. Well-designed sorting tables and benches soon pay for the small cost incurred, as well as helping to materially reduce working hours.

Custard Apples.

Custard apples are now nearly finished, very little first-quality fruit now coming on the market, 2s. to 3s. 6d. being realised.

Passion Fruit.

Passion fruit are finding a ready demand for good lines of well-packed fruit. A pamphlet "Marketing Passion Fruit" is obtainable from the Under Secretary, Department of Agriculture and Stock, free on application, showing the easiest and correct methods of packing in all cases.

Prices 5s. to 12s. Crinkled fruit should be sorted from smooth skins and marketed separately, as they spoil the value of choice lines.

Papaws.

Greater attention still needs to be paid to marketing only ripe papaws during the cold weather. This fruit will not ripen when picked green. Coloured fruit can at present be sent to Southern markets with

safety, while for local market the fruit needs to be ripe. Retailers trying to ripen uncoloured fruit find it goes specky and becomes unsaleable. The prices—1s. 6d. to 4s. per bushel—give a true indication of the difference in quality. With the close advent of warm weather, growers will need to exercise discretion with southern consignments when studying colour.

Pineapples.

Moderately heavy supplies of pines have been coming to hand, and the maturity appears to be better than in some previous seasons. All precautions should be taken to eliminate all chance of specimens with black heart being marketed, as these upset the confidence of buyers. Small Smooths are not in popular demand. Prices, 1s. to 5s. a dozen; cases 3s. 6d. to 6s.

Strawberries.

Small berries are hard to dispose of at payable prices. Many lines are seen which are not well packed. The berries should be stood up well so that the point comes just below the level of the lid. Empty packs are not popular with buyers.

General.

Assistance in marketing can be obtained by growers by applying to the Under Secretary, Department of Agriculture and Stock. This service is free; and growers should take full advantage of it.

MUSHROOM CULTURE.

Mushrooms may be grown in beds in the open, but there is no doubt that better results are obtained in an underground room or cellar, or in a covered shed or room where more even temperature may be obtained and moisture conditions may be controlled. As a basis for making the beds fresh horse manure is the most suitable. If only small quantities are available at a time, the manure should be collected daily and spread out in thin layers to dry, and thus retard fermentation. About half a ton of manure will be required for one packet of spawn, and this will make a bed of about 20 square feet. When a sufficient quantity of manure has been collected, moisten it with water, and stack it to ferment. Turn the heap over daily, bringing the outside of the heap into the centre to ensure even fermentation. After about five or six days the heap should have a brown colour. The moisture content is important, and when ready for making the bed a handful of manure squeezed hard will only show a drop of moisture between the fingers. If too wet allow the fermentation to proceed until the surplus moisture has evaporated. Now make up the beds, packing the manure in layers, and tramping firmly to make a bed from 6 to 10 inches deep. When the temperature in the bed recedes to about 70 degrees, break up spawn in pieces about the size of a walnut, and insert to a depth of half an inch in the manure and about 10 inches apart, pressing down firmly to obtain good contact. Two weeks later place a layer of good sandy loam to a depth of 1 inch over the bed. Cover the bed with newspapers, which should be kept damp, but no water dripping from them. After six weeks tiny mushrooms will appear, when the paper must be removed. Now water the bed with a light sprinkling, just sufficient to keep the soil moist, and keep the bed in that condition throughout the cropping period, which should be about three months. Over-watering is fatal, and will destroy the spawn.—"The Australasian."

The 1935 Brisbane Exhibition.

PLATE 105.—THE GOVERNOR'S GUARD OF HONOUR AT THE OPENING CEREMONY.

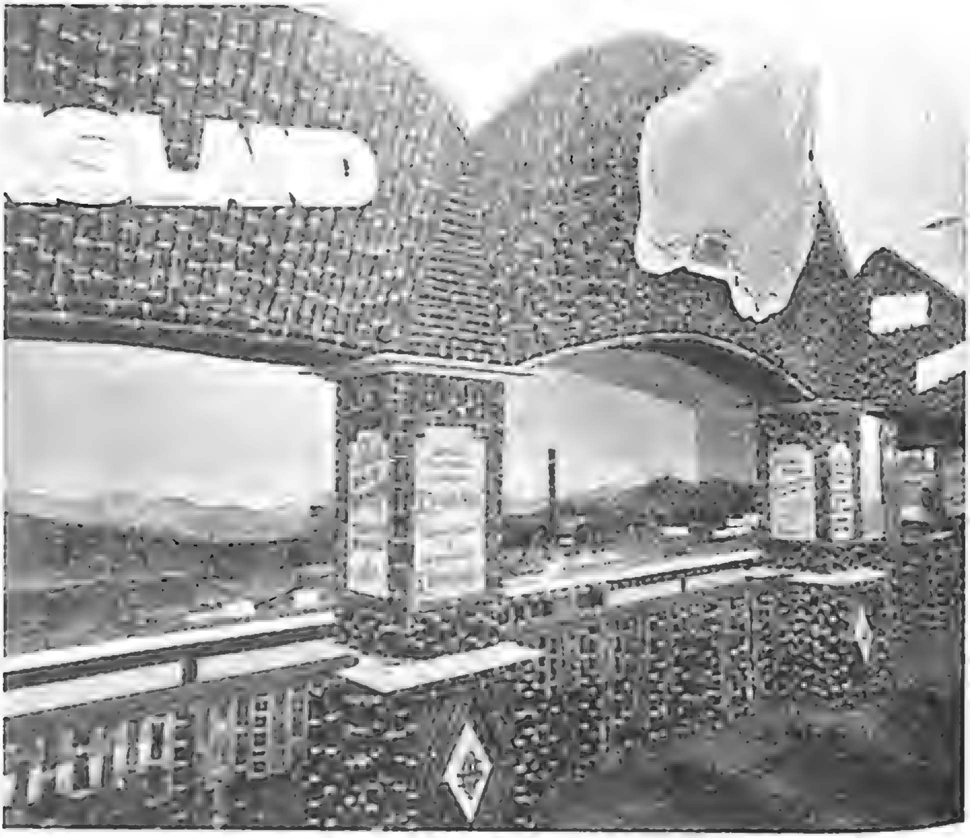


PLATE 106.—THE IMPRESSIVE DISPLAY ARRANGED BY THE SUGAR INDUSTRY.

This year's sugar exhibit at the Brisbane Show surpassed all previous displays in its range and interest. It illustrated very effectively the national, economical, and social importance of the sugar industry. To even the experienced canegrower its educational value was immense, while to others it was an amazing and striking representation of Queensland's chief agricultural enterprise in all its branches.

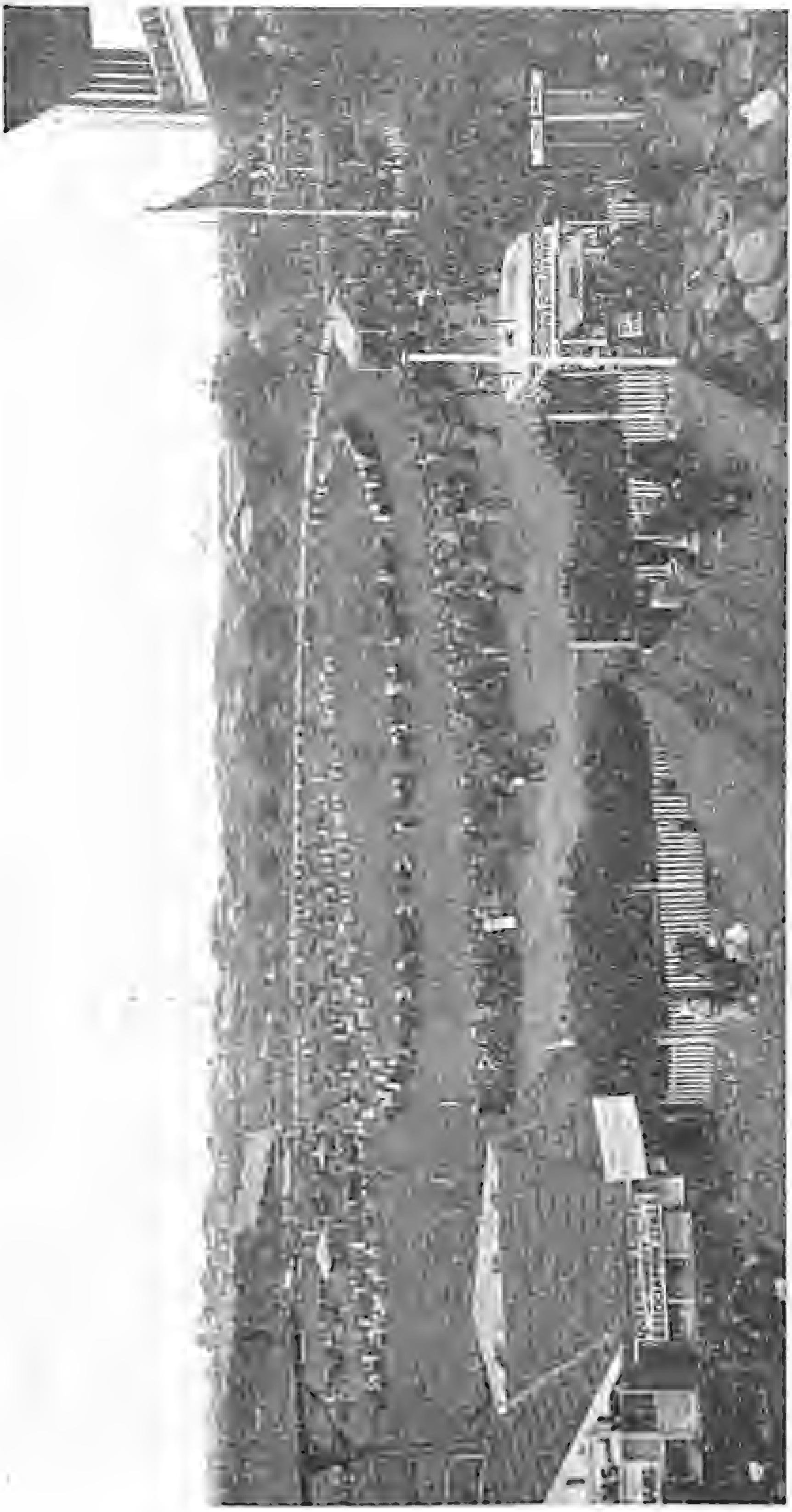


PLATE 107.—GRAND PARADE, BRISBANE EXHIBITION.

The Brisbane Show is regarded as one of the finest Stock Shows in Australia. The estimated value of the farm animals paraded for judgment at this year's Exhibition was £250,000.

PLATE 108.—A STUDY OF "COUNTS" AND CLASSES.

Queensland's wealth in fine merino wool was well represented in the exhibit in the Departmental Court.

PLATE 109.—A LINK BETWEEN THE LABORATORY AND THE LAND

This and other interesting displays of the Entomological Branch of the Department of Agriculture and Stock illustrated effectively the application of science to the problems of the primary industries.

PLATE 110.—THE "JOURNAL" AT THE BRISBANE SHOW.

The young officer in the picture is Mr. T. Abell. Mr. Arthur Crees was the officer in charge of the Bureau which was the distributing centre of information on the activities of the Department of Agriculture and Stock—a service much appreciated by visiting farmers.

PLATE 111.—THE TOBACCO TROPHY.

Samples of soil types, varieties of fine Queensland leaf, and a model flue-curing barn were the main features of this interesting display.

PLATE 112.—THE COTTON CORNER OF THE AGRICULTURAL COURT.

Cotton growing is developing steadily to the status of a major industry in this State. Australian looms are supplied largely with Queensland lint of high spinning quality.

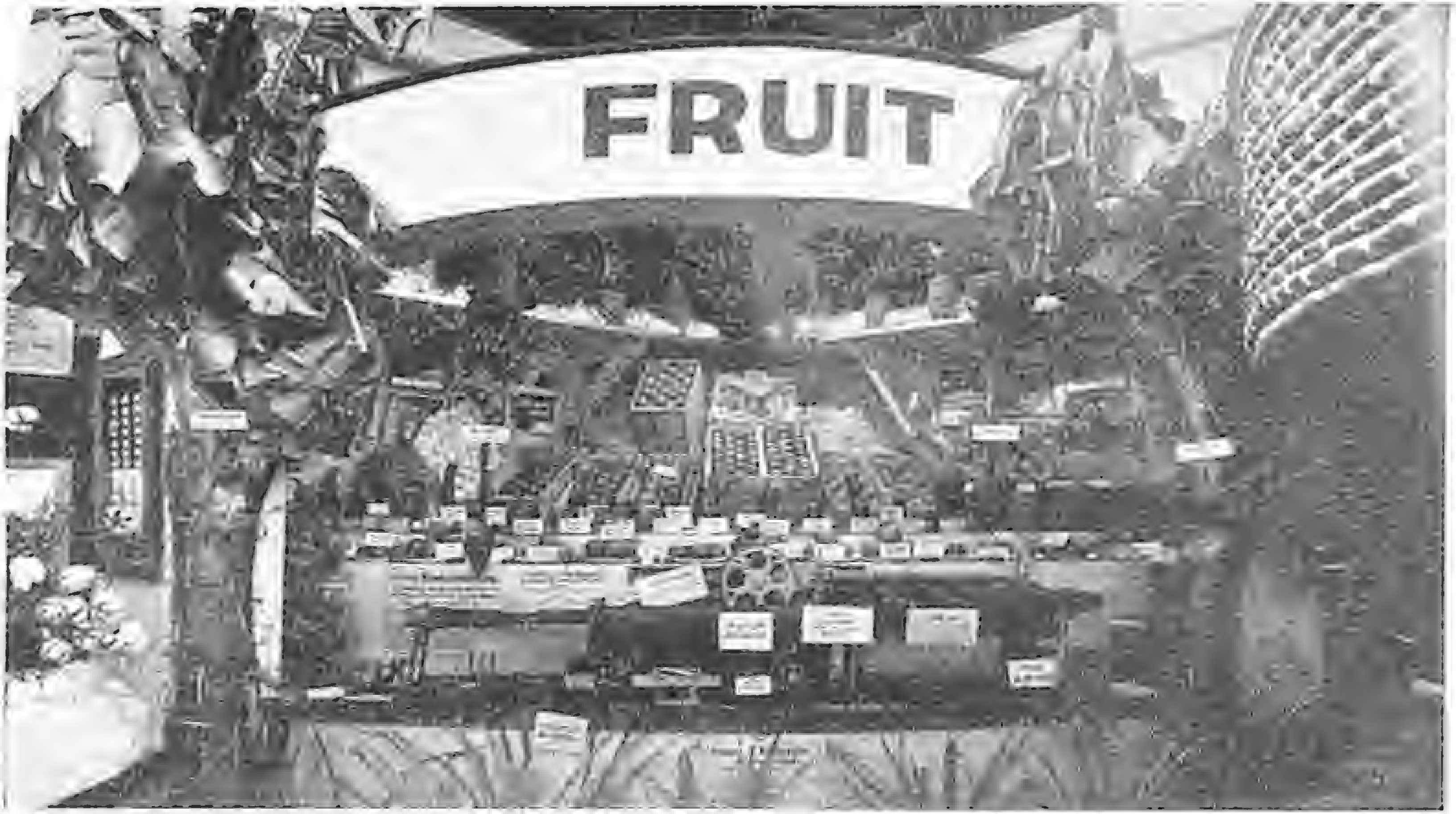


Plate 113.—A Popular Corner in the Agricultural Court.

Both temperate and tropical fruits, which are produced abundantly in Queensland, were well represented in the Departmental display. Other sections of the Show contained large collections of fruit, remarkable in their range, variety, and excellence.

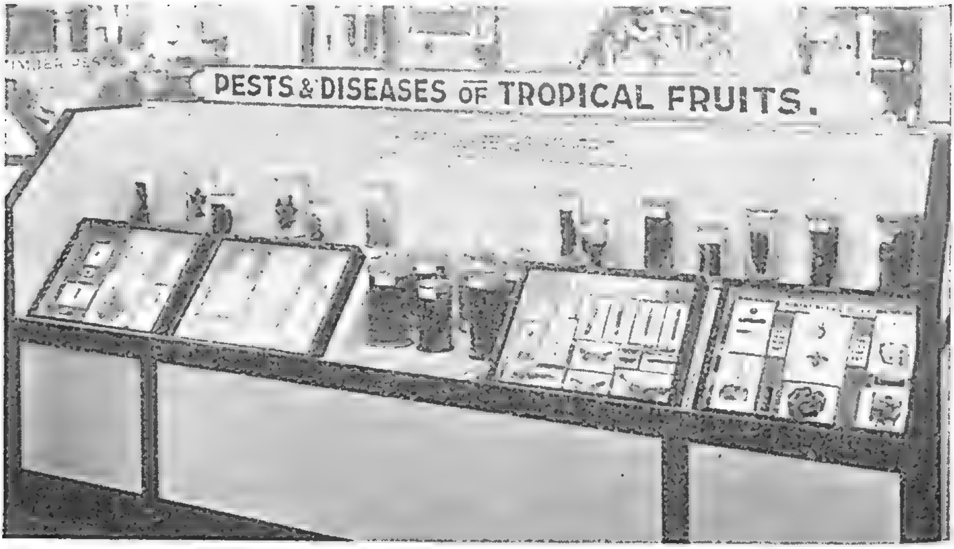


PLATE 114.—SCIENCE IN AGRICULTURE.

PLATE 115.—SCIENCE IN AGRICULTURE.

The value of Economic Entomology and Vegetable Pathology in our rural economy was illustrated interestingly and effectively in the Departmental Court.

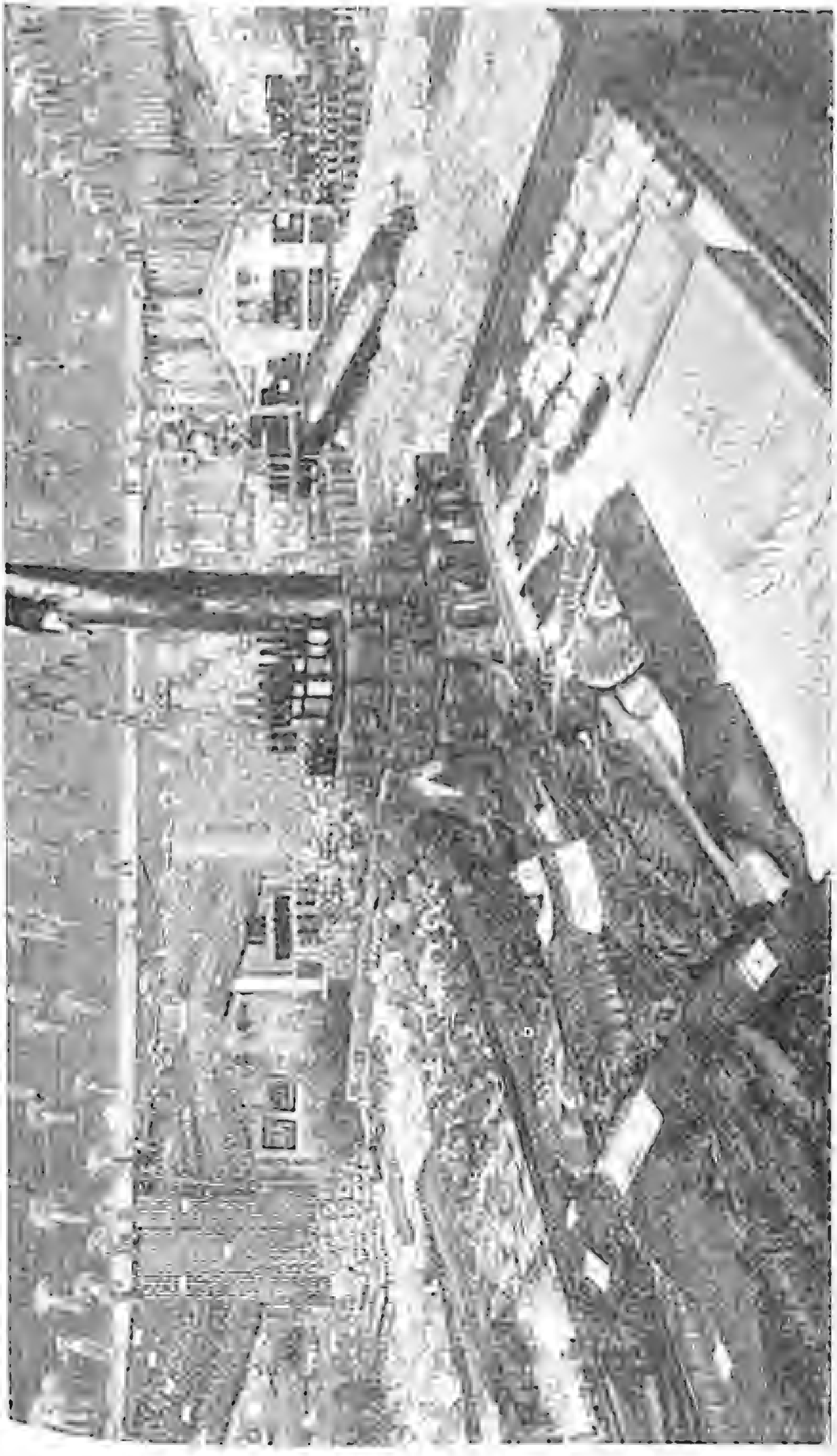


PLATE 116.—WINGHAM "A" GRADE DISTRICT EXHIBIT.

Comprehensive and impressive display from the Northern Rivers District of New South Wales.

PLATE 117.—THIS PANEL IN THE AGRICULTURAL COURT WAS A CENTRE OF ATTRACTION TO SHOW VISITORS.

PLATE 118.—AN EDUCATIONAL EXHIBIT.

The importance of Forest Entomology to Queensland's valuable timber industry was well illustrated in this and other cabinets in the Court of Agriculture.

Plate 119.—The Wealth of Queensland's Great Grain Lands.

The central trophy in the Agricultural Court was evidence of the plant breeder's success in evolving wheats suitable to Queensland's conditions of summer rainfall. It illustrated also the progress made in maize production and the propagation of new varieties.

PLATE 120.—EXHIBIT FROM ST. LUCIA FARM SCHOOL.

Young farmers displayed with pride some of the first fruits of their training and field work. St. Lucia Farm Training School, situated in University grounds on a fertile Brisbane River frontage, is proving an important factor in the solution of the problem of jobless youth in Queensland. The boys receive an excellent training, amid delightful surroundings, in the rudiments of agriculture, and on the completion of a six-months' course are absorbed immediately in rural industry. The demand for St. Lucia trainees already exceeds the supply.

PLATE 121.—A WORKING MODEL OF A QUEENSLAND SUGAR MILL.

Built to scale, this miniature mill was one of the main features of a very fine sugar exhibit that attracted great public interest daily throughout Show week.

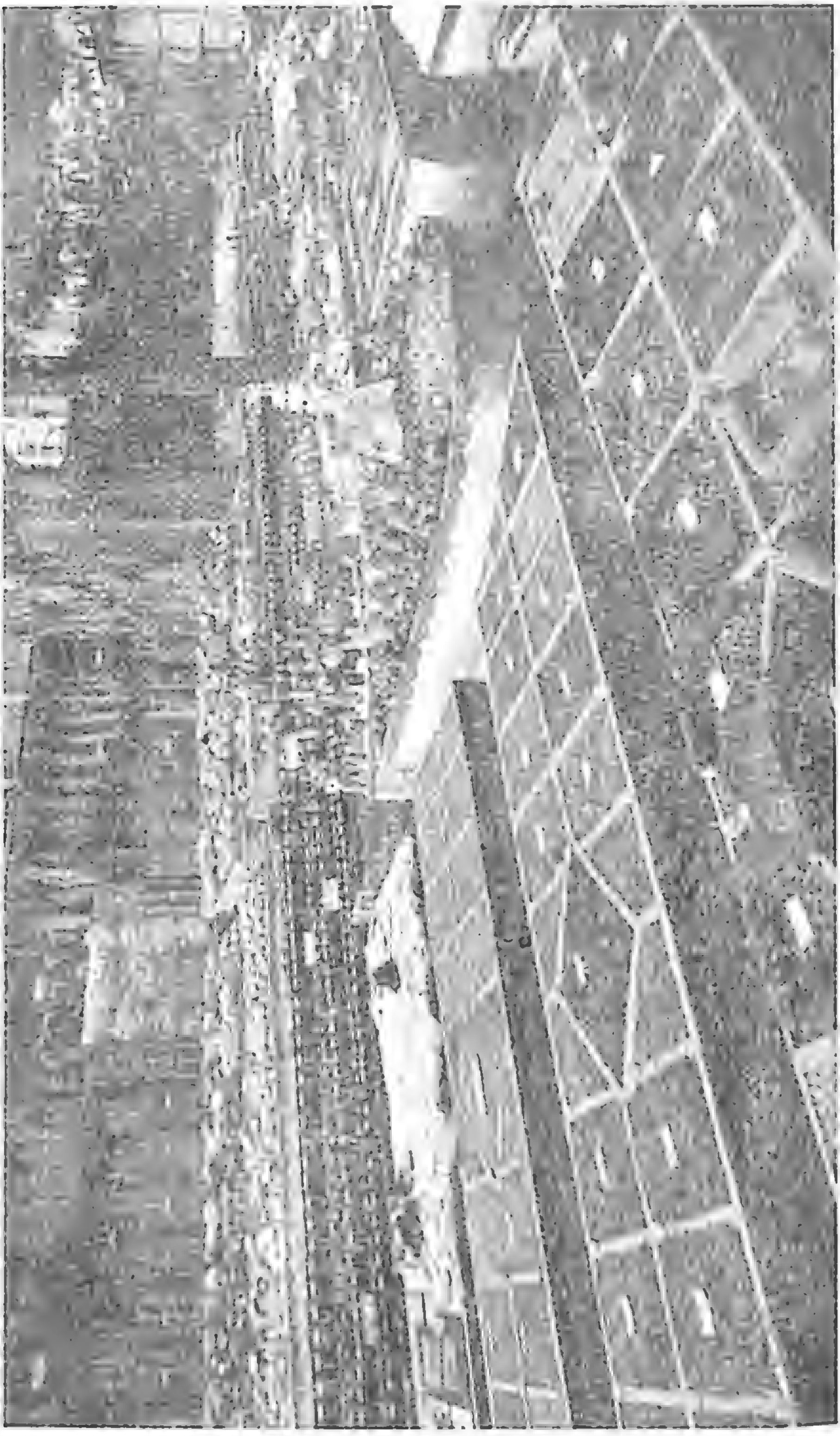


Plate [illegible].—[illegible] District Exhibit.

A remarkable representation of the immense wealth of the Nanango (South Burnett) District.

Plate 123.—Section of the Exhibit from the Animal Health Station.

The value of veterinary research in its many branches was well illustrated in this display in the Court of the Department of Agriculture and Stock. Queensland, however, is one of the healthiest stock countries in the world.

PLATE 124.—PANEL OF NATIVE GRASSES.

Studies of indigenous and introduced grasses and edible shrubs are among the most important branches of the research work of the Department of Agriculture and Stock.

FEATS OF HORSEMANSHIP.

Mr. A. W. Lade (Deniliquin, N.S.W.) has the following interesting notes in the "Questions and Answers" column of "The Australasian" of 13th July:—

"Mr. Basil Hall, in 'The Australasian' of 29th June, has touched on a subject which interests me very much. In the hope that they may be of some use to him, I have copied out two authentic accounts of an outstanding nature. On reading them one can but wonder if such men, horses, and sheep could be found in the land to-day."

Extract from an obituary notice of Mr. Langloh Parker, in the "Pastoralists' Review," August, 1903:—" . . . He was a man of high honour and great power, a splendid judge of stock, and generally popular, and his ride of 320 miles in 24 hours, with seven changes of horses, from Yanga to Deniliquin, is one of the historic traditions of pastoral New South Wales."

Note.—It would be interesting to know more details of this truly great ride. It must have taken place in the '60's or '70's, when Mr. Parker was a much younger man. Further particulars from other readers would be of general interest.

Extract from "Sheep Breeding," by "Bruni" of "The Australasian" (2nd edition, 1890), page 354:—"In 1885 a drover named Richard Coulter started from Deniliquin in charge of 466 Tandara rams, his destination being the Afton Downs Station, near Hughenden, in Northern Queensland. The season was one of the worst ever known, and the distance the sheep had to travel was 1,700 miles. In many places there was not a blade of grass to be seen, and for 300 miles the sheep lived on scrub cut down for them. By the exhibition of rare skill and judgment Coulter managed to deliver every ram at the Queensland station, and throughout their long journey the sheep averaged nine miles a day."

Note.—This is not so spectacular as some of the cattle-droving feats, but for sheer merit is hard to beat.

Plate 125.—St. Lucia Farm School.

Showing officers' and trainees' quarters, including new dormitory (left centre). The lagoon is a sanctuary for aquatic bird life which abounds on its banks. It is also the water supply for an irrigated garden which supplies the farm kitchen with vegetables the whole year round.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, the Ayrshire Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of July, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Beauty Valera	M. C. and A. M. Sullivan, Pittsworth	13,319·18	573·524	Royalist of Strathdu
Empress 17th of Sunnyside	P. Moore, Wooroolin	11,674·81	461·693	Prince of Avonel
Meadow Vale Ladybird 3rd	C. O'Sullivan, East Greenmount	8,510·85	384·545	Plumstone of Meadow Vale
Hillvale Baby	J. H. Weber, Peak Crossing	9,080·11	373·124	Marvel of Greyleigh
Belinda of Nestles	H. M. Graham, Goomeri	8,724·28	365·332	Nelson of Darbalara
Model of Kia Ora (267 days)	J. H. Weber, Peak Crossing	9,693·97	361·329	Red Knight of Greyleigh
Happy Valley Myrtles Molly	R. R. Radel, Biggenden	8,661·7	355·547	Molly's Hero of Glenthorn
Lovely 3rd of Alva Glen	G. H. Knowles, Nanango	9,651·65	355·142	Cashier of Greyleigh
Waverley Beauty	R. Scott, Toogoolawah	10,692·2	351·971	Banker of Oakvale
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Glenore Vida	H. M. Graham, Goomeri	8,161·84	347·276	Starlight of Sherwood
	JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.			
Home Hill Doris	E. O. Althouse, Cloyna	8,114·43	324·577	Sir James of Oakvale
Kalinga Bloom	E. O. Althouse, Cloyna	7,778·77	310·414	Bruce of Gulvallis
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Glencairn Peach	H. M. Graham, Goomeri	7,747·57	322·529	Roslyn of Woodmerle

Junior, 3 Years (under 3½ Years), Standard 270 Lb.				
Blacklands Red Plum 6th	M. C. and A. M. Sullivan, Pittsworth	13,807·33	460·63	Hugo of Blacklands
Glenore Dainty	A. M. Johnson, Gracemere	9,775·6	343·968	Sunnyview Union Jack
Fairlie Princess 17th	C. B. Mitchell, Fairlie, Warwick	6,571·69	282·504	Rosenthal Handsome Boy
Brundah Isis 2nd	Mrs. K. Henry, Greenmount	7,540·25	274·077	Osiris of Greyleigh
Senior, 2 Years (over 2½ Years), Standard 250 Lb.				
Gentle 2nd of Alfa Vale (365 days)	W. H. Thompson, Nanango	13,424·26	631·752	
Murray's Bridge Charm II.	Mrs. K. Henry, Greenmount	8,098·2	346·919	Charmer of Murray's Bridge
Rhodesview Strawberry 2nd	W. Gierke and Sons, Helidon	8,413·24	317·235	Rhodesview Red Knight
Lovely 7th of Alva Glen	G. H. Knowles, Nanango	7,884	299·454	Nell's Son of Alfavale
Frankvale Kitty	Mrs. L. J. McCauley, Mundubbera	7,950·39	294·382	Hot Stuff of Blacklands
Glen Cairn Daisy	H. M. Graham, Goomeri	6,673·93	282·909	Roslyn of Woodmerle
Junior, 2 Years (under 2½ Years), Standard 230 Lb.				
Daphne of Valera (271 days)	M. C. and A. M. Sullivan, Pittsworth	10,368·18	387·671	Blacklands Daphne Boy
Navillus Nancy	E. W. Jackson, Nobby	8,112·41	302·084	Midgets Sheik of Westbrook
Beauty 2nd of Alva Glen	G. H. Knowles, Nanango	7,249·25	297·674	Nell's Son of Alfavale
Rhodesview Queenie 16th	W. Gierke and Sons, Helidon	6,836·88	288·104	Rhodesview Red Knight
Evelyn II. of Navillus	E. W. Jackson, Nobby	7,018·25	278·409	Midgets Sheik of Westbrook
Fairlie Princess 20th	C. B. Mitchell, Fairlie, Warwick	6,147·09	274·025	Miner of Fairlie
Navillus Olive Palm	E. W. Jackson, Nobby	6,755·78	262·249	Midgets Sheik of Westbrook
Navillus Fancy II.	E. W. Jackson, Nobby	6,568·5	254·862	Midgets Sheik of Westbrook
Glen Cairn Beauty	H. M. Graham, Goomeri	6,621·28	254·54	Roslyn of Woodmerle
Happy Valley Maureen	R. R. Radel, Biggenden	5,944·5	251·573	Happy Valley Donaster
Navillus Melba	E. W. Jackson, Nobby	6,040·02	244·148	Midgets Sheik of Westbrook
FRIESIAN.				
Mature Cow (over 5 Years), Standard 350 Lb.				
Inavale Grace 8th	A. O. Stumer, Boonah	10,722·25	394·183	Anama Drikjes Pride

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AYRSHIRE.			
	SENIOR, 4 YEARS (OVER 4 YEARS), STANDARD 330 LB.			
Fairview Josies Maid	R. M. Anderson, Southbrook	10,403·2	427·579	Longlands Bonnie Willie II.
	GUERNSEY.			
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Willowbrae Mascot	H. T. Blanch, Eudlo	5,685	301·373	Willow Brae Laddie
	JERSEY.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Lottie of Southport	H. T. G. Gibson, Kingaroy	6,243·5	402·437	Werribee Twylish Starbright King
Mayflower of Southport	H. T. G. Gibson, Kingaroy	6,659·1	397·113	Werribee Twylish Starbright King
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Brooklands Desert Majesty	W. C. Conochie, Sherwood	8,138·25	438·812	His Majesty of Dalebank
	JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.			
Brooklodge Melba	J. Cummings, Nerang	5,811	343·721	Carlyle Empire's Songster
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Trecarne Jean	R. A. Slaughter, Clifton	5,681·03	309·159	Mascot of Brassaldale
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Cabulcha Milroy	J. M. Newman, Caboolture	5,699·55	291·512	Cabulcha Bright Star
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
White Rose of Hamilton (268 days)	J. Wilton, junr., Raceview	8,059·68	525·845	Retford May's Victor
Aileen of Sunnyview	A. Geritz, Goomeri	6,288·3	340·468	Golden Noble of Hillview
Glengariffe Noble Countess 11th	Cox Bros., Witta	5,251·9	269·996	Retford Royal Atavist
Abbeystead Sylvia	J. Newman, Caboolture	4,640·9	252·936	Trinity Ginger Boy

JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.

Trinity Spotted Lily	J. Sinnamon and Sons, Moggill	7,144·42	429·071	Some Hope
Brooklands Royal Plate	W. S. Conochie, Sherwood	6,919·65	338·975	Retford Earl Victor
Inasfayl Noreen	McGeehan Bros., Kairi	5,663·7	320·595	Inasfayl Primrose Boy
Maiwand Verbena	Queensland Agricultural High School and College, Gatton	5,308·63	299·695	Holly Rex
Kathleigh Betty	F. W. Kath, Ellesmere	6,166·6	296·333	Retford King's Thorn
Kathleigh Nettie	F. W. Kath, Ellesmere	5,689·9	288·519	Retford King's Thorn
Dawn Victors Princess	A. L. Walker, Dawn	5,304	280·709	Retford Glory's Victor
Trecarne Magnetette	R. A. Slaughter, Clifton	4,365·78	264·327	Trecarne Royal Boy 2nd
Wyreene Duchess II.	J. B. Keys, Gowrie Little Plains	4,586·38	253·215	Lyndhurst Majesty
Glengariffe Noble Foxglove 5th	Cox Bros., Witta	4,481·35	242·137	Retford Royal Atavist
Shamrock II. of Woodlands	J. M. Newman, Caboolture	3,903·65	232·466	Prospect of Woodlands

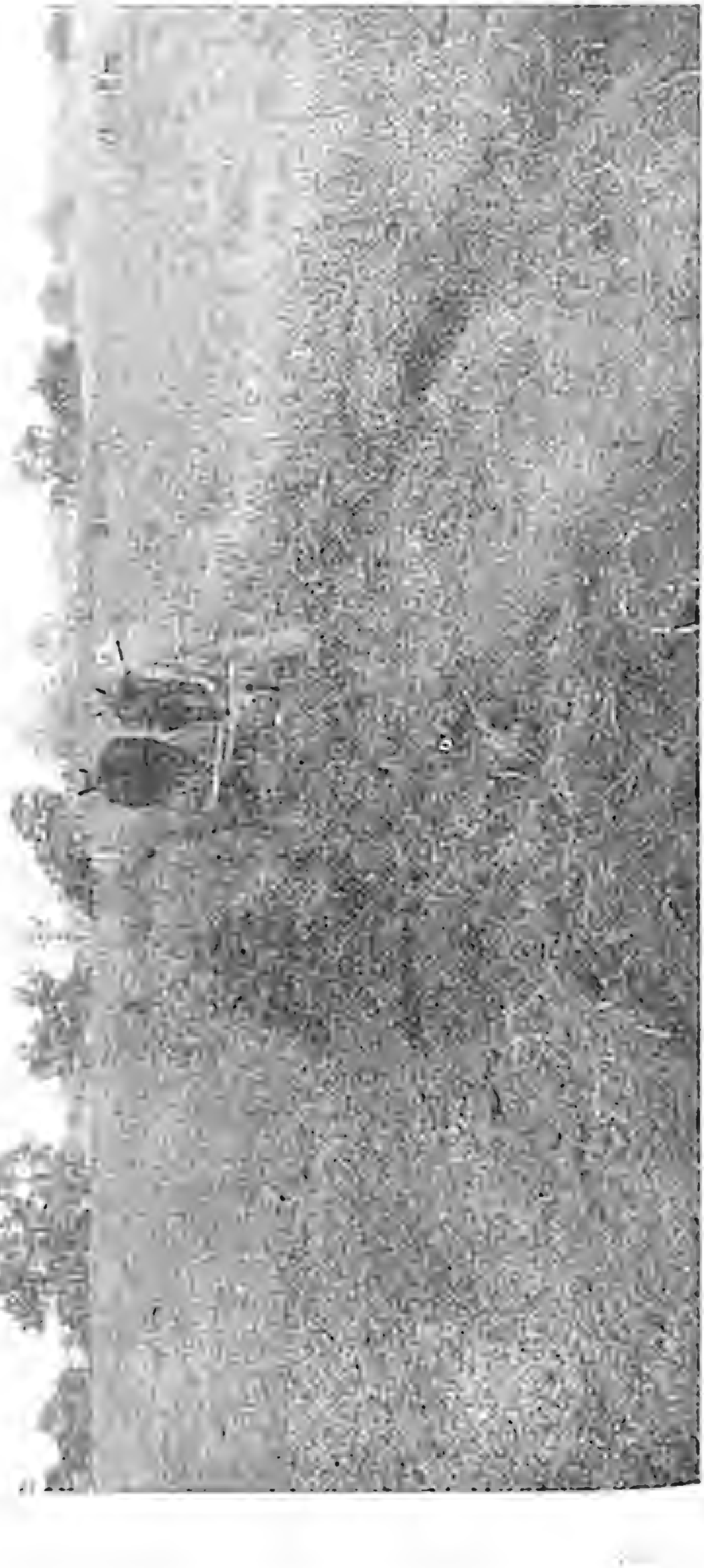


PLATE 126.—OPENING UP FRESH FURROWS, ST. LUCIA FARM SCHOOL.

Answers to Correspondents.

BOTANY.

Grasses and Clovers.

GRASS CLUB (State School, Nogo Junction, via Ceratodus, N.Q.)—

1. Perennial prairie grass (*Bromus marginatus*) is very similar in appearance to the ordinary Prairie grass, which is one of the best winter fodders in Queensland. It is, however, a true perennial species, producing a great deal of leafy fodder, and is well worthy of encouragement. It will probably be found that it does not succeed well except when it is cultivated after planting.
2. Annual prairie grass (*Bromus unioloides*), a native of North America, and now widely cultivated in most warm temperate countries as a pasture grass, particularly for dairy cattle. It produces a great deal of leafy fodder, and is quite naturalised in Queensland. When not cultivated, it is generally found around stockyards, home gardens, &c., or anywhere where the ground has been disturbed, rather than in ordinary pastures.
3. Perennial rye grass (*Lolium perenne*). Perennial rye grass can be distinguished from other rye grasses by its perennial character. It is one of the oldest grasses in cultivation as a fodder, and is practically the standard grass of most temperate countries, such as England, New Zealand, parts of North America, &c. Under Queensland conditions it is not truly perennial in habit. To assist its spreading, and to ensure its forming a permanent sward, it is said it should be fed off the first year before seeding.
4. Cocksfoot (*Dactylis glomerata*). A perennial grass, with an erect stem 1 to 2 feet high, sometimes larger on exceptionally good soils. It is tufted in habit, and does not creep like perennial rye grass. It has done quite well in some Queensland localities, and is worth encouragement.
5. Wimmera rye grass (*Lolium subulatum*). This grass first came to notice as a winter grass in the Wimmera district of Victoria, hence its local name. In the Southern States it is often sown with wheat as a cover crop, the combined crop being cut for hay or fed off in the ordinary way.
6. Western Welth's rye grass. This is a strain of the Italian rye grass that of recent years has become increasingly popular in the Southern States of Australia and in New Zealand, both for grazing and for hay.
7. Cluster clover (*Trifolium glomeratum*). An annual clover that often comes up spontaneously in Queensland. It is characterised by the flowers and seeds being borne in little globose heads along the stems, hence the local name. We think it is one of the best of annual clovers for Queensland conditions, and stock seem particularly fond of it.
8. Burseum clover (*Trifolium alexandrinum*). This is a tall-growing clover that has been cultivated on the Darling Downs from time to time, and does fairly well. It has gone out of favour in Queensland, probably for the reason that it is not suitable for grazing, but is mostly grown for hay. Where it will grow, generally speaking, lucerne does as well and is much better for the purpose. The only slight advantage it may possess over lucerne is that it produces early winter feed.
9. Alsike clover (*Trifolium hybridum*). This clover is a perennial, and very similar to the common white clover in general appearance, but is easily distinguished by its pink or red flowers. We have had very little experience with it in Queensland, but in the Southern States it is said to be one of the first clovers to succumb rapidly on the approach of hot, dry summer weather.
10. Bokhara clover (*Melalotus alba*); a lucerne-like plant with a rather sweetish and distinctive scent. Both annual and perennial forms are in cultivation. We have not seen very much of it in Queensland, but it has been grown quite extensively in New South Wales, and is one of the favourite leguminous crops in the United States.

Books in which you would find much useful information are—"Grasses and Fodder Plants of New South Wales," by E. F. Breakwell, obtainable from the Government Printer, Sydney, price 6s. 6d. posted—although this deals mainly with New South Wales, the vast majority of species dealt with also occur in Queensland—and "Grass Plants and Green Crop Manuring," price 1s., obtainable from Messrs. Arthur Yates and Sons, Limited, Post Office Box 2707C, G.P.O., Sydney.

Desert Poison Bush. Turpentine Grass. "Desert Mitchell Grass."

B.W. (Maxwelton)—

1. Heart Leaf Poison Bush or Desert Poison Bush, *Gastrolobium grandiflorum;* the poisonous principle is an alkaloid—gastrolobium. The alkaloid is not destroyed by drying, and dried leaves may be almost or quite as toxic as the living. Failure to recognise this has sometimes led people to allow sheep to graze in paddocks where the gastrolobium bushes have simply been cut down and allowed to wilt. The plant is one of the most serious poisonous plants we possess, and much more remains to be discovered concerning it, particularly at what stage of its growth it is most serious. Some graziers believe that the plant is worst following a burn, but this may be due to the fact that animals eat more of the tender young shoots following a burn than they would of the somewhat dry and harsh adult leaves. Gastrolobium is one of the few plant poisons for which an antidote is known. The use of Condy's crystals (permanganate of potash) administered as a drench, is said to be a sure and safe treatment, although, of course, it must be administered before the poison has taken full effect. D. A. Herbert, in a valuable bulletin on the poisonous plants of Western Australia, quotes several cases of the successful use of the antidote in that State, and recommends as effective doses for sheep and pigs 10 grains (about as much as will comfortably lie on a sixpence), for horses 15 to 20 grains, and for cattle 30 to 50 grains. He states that the action of the antidote is more rapid when the stomach is in an acid condition. There are two or three methods of attaining this end. The use of lime juice or vinegar has been recommended, but the experiments of Chestnut and Wilcox, Americans working on allied leguminous plants, show that aluminium sulphate is the most satisfactory substance. The genus *Gastrolobium* is very strongly developed in Western Australia, and about fifteen species or different sorts are known to be poisonous to stock in that State.

2. *Triodia* sp., a species of turpentine grass or spinifex, only of value when very young or in seed, the seed heads being a valuable fodder.

3. *Bothriochlea* sp., sometimes called the desert blue grass. We would say this is the best grass in the desert country, and quite a valuable fodder. It is sometimes called "Desert Mitchell," though it is not a Mitchell grass, and is more closely allied to the blue grasses.

The specimens were not very satisfactory for analysis.

Ball Nut.

H.A.J. (Maryborough)—

The specimen represents the ball nut, *Macadamia pracalta,* a species with an extremely limited range in South Queensland. As you suspect, it is a very closely allied plant to the common Queensland nut, or Australian bush nut, *Macadamia ternifolia.* It is not known to be poisonous, but its very bitter taste will always mitigate its value as a nut. As some of these bitter kernels of *macadamia* and allied plants possess a prussic-acid-yielding glucoside, we have passed your specimen on to the Agricultural Chemist, Mr. Gurney, and if he is able to find anything in it we will let you know.

Mat Grass.

H.W.P. (Pomona)—

Your specimen represents the mat grass or carpet grass (*Axonopus compressus*), to which much publicity has been given in recent years. There are two forms of it—the broad-leaved and the narrow-leaved, and your specimen represents the former, which is generally regarded as the better of the two. Mat grass, particularly the broad-leaved form, has a definite value, we think, on second-class or poor country. It should not be allowed where possible, however, to get into better country, such as paspalum pastures, because these if closely grazed soon become overrun by the grass, which very much reduces their carrying capacity. In fact, many farmers are so concerned over the spread of this grass along certain parts of the near North Coast, particularly in paspalum pastures, that they consider it a distinct menace. The only satisfactory method of eradication is to attack it when it first appears, and apparently this is possible in your case.

Some Grasses of Mackay District Identified.

Club Secretary (Sybil Creek State School, Finch Hatton, Q.)—Your specimens have been determined as follows:—

1. *Eragrostis pilosa.* A kind of Love grass. Most of the Love grasses are useful constituents of the average native mixed pasture. This particular one is commonly met with as a weed of cultivation, along roadsides and in similar situations.
2. *Digitaria* sp. Most of the Digitaria grasses are fairly useful fodders.
3. *Eriochloa* sp. The Eriochloa grasses are sometimes known as Early Spring grasses or Dairy grasses. However, neither of these names is particularly appropriate. They are all useful pasture grasses.
4. *Eragrostis elongata.* A kind of Love grass. See notes on No. 1.
5. *Paspalum orbiculare.* Generally regarded as an inferior grass and not freely eaten by stock.
6. *Paspalum dilatatum.* This is the common Paspalum grass of coastal Australia. It is the chief dairy grass of Queensland.
7. *Sorghum fulvum.* Brown Sorghum. A native species of whose fodder value little is known.
8. *Sporobolus Berteroanus.* Parramatta grass. Generally rejected by stock and practically useless as a fodder.
9. *Themeda australis.* Kangaroo grass. A native grass which is quite a good fodder when young, but which becomes harsh and unpalatable at maturity. It disappears very quickly under stocking.

Saltbush. Frost-resistant Rhodes Grass.

T.G. (Nerang)—

We have spent a little time over the specimen of Saltbush, but fail to recognise it. It looks like the Barrier saltbush, *Enchylaena termintosa*, but it might be a species of *cochia.* You had better send a specimen along as soon as it is in fruit, which would probably be about October or November. Regarding the winter-growing or frost-resistant Rhodes grass, this is *Chloris distichophylla.* It is a native of Brazil, and has been grown here in Queensland for a number of years, mostly as an ornamental plant, but it seems to possess quite good possibilities as a fodder. The following description of the plant has been drawn up by one of our assistants, Mr. S. L. Everist, from material in our collections:—*Chloris distichophylla* is a densely tufted grass with short stout rhizomes, from which are given off numerous very much flattened leafy shoots. The roots are fibrous and numerous, and give the grass a very firm hold upon the ground. The young shoots are produced upon the outside of the clumps, and so help increase the size of the tufts. The leaves are given off very close together from a short, rigid, upright stem. The leaf sheaths, which are purple at the base, are broad, much flattened, and sharply keeled, and are conspicuously distichous. The leaf blades are fairly long and rigid, smooth, and quite free from hairs. They are green in colour, and markedly folded throughout their life, although they may become slightly flattened when old. The seed stalk is long and upright, and gives off at the top numerous long, slender, flexuous, closely clustered branches. Upon these branches are borne numbers of small, flat, brown spikelets or "seeds." Each of these bears a fringe of white hairs upon both edges. They fall off readily when the seed head is mature.

Guinea Grass.

H.J.C. (Wondai)—

The specimen represents Guinea grass, *Panicum maximum*, a grass well worthy of encouragement, we think, as a fodder for dairy cattle. It is a perennial species, generally looked upon as tropical, but it seems to stand through the winter months as well, almost, as anything. The percentage of fertile seed is generally small, but this may be due to the fact that it does not keep very well, and if it is intended to propagate it from seed, seeds should be sown practically directly after gathering. It is very palatable to all classes of stock, but is more of a grass of cultivation than of the ordinary pasture. A small paddock, however, of it for periodical cutting or grazing, we should say, would be a sound asset.

Tick Trefoil.

R.S.P. (Yungaburra), N.Q.—

Your specimen represents *Desmodium triflorum*, a species of Tick Trefoil, common in coastal Queensland, but widely spread throughout the Pacific and Malayan regions. It is a valuable fodder plant, but in closely grazed pastures grows rather close to the surface to give stock a decent bite. We have, however, seen it in lightly grazed paddocks forming, with paspalum and couch, an excellent pasture. When once introduced into a locality it generally spreads naturally. Its name arises from the fact that the small pod breaks up into one-seeded pieces, each covered with minute hairs or bristles, which cling to the hairs of animals, clothing, &c.

Poa Aquatica.

J.K.L. (Wooloowin)—

In our opinion *Poa aquatica* is quite unsuitable for growing about Port Darwin. It thrives very well in some of the swamp lands of Victoria, and has done wonderful work in reclaiming some country about Bacchus Marsh and other places. We have not seen any of it growing well in Queensland, and attempts mostly have failed. The only record that we have of its doing well is from a correspondent at Ravenshoe, North Queensland, and this locality, as you know, is high and quite cool. The best grass, we think, for growing in swampy land about Darwin would be *brachiaria mutica*, or, as it is generally known in Queensland, *panicum muticum.* This grass does not produce a great quantity of fertile seed, but is usually propagated in the same way as *poa aquatica*, by joints put in the mud, or just simply thrown into the water.

Grasses from South Burnett Identified.

Winter Fodder Project Club (Goomeri)—

(1) *Sporobolus elongatus*. Rat's tail grass. A common grass in Eastern Australia, but of little use as a fodder.

(2) *Rhynchelytrum repens*. Red Natal grass. An introduced grass now very abundant in coastal Queensland. It is not generally relished by stock, but is useful in the form of chop-chop.

(3) *Agropyron scabrum*. Wheat grass. A weed in parts of Queensland, and usually regarded as of little value.

(4) *Bothriochloa intermedia*. Forest blue grass. A native grass fairly common in forest country and along watercourses. In some parts of Queensland it is looked upon as an excellent fodder grass.

(5) *Bothriochloa decipiens*. Bitter or pitted blue grass or red grass. This is an inferior grass which has over-run much country in Eastern Australia. In the Southern States it has been found that top-dressing the pastures with superphosphate to encourage the growth of clovers tends to eradicate this grass.

(6) *Cyperus gracilis*. A sedge, not a true grass.

Zamia (Grass Tree) Poisonous to Pigs.

An inquirer from the North asked recently if the small tree-like fern usually referred to as grass tree, and which produces a type of nut called zamia, is poisonous to pigs, or causes them to develop rickets.

Replying to the inquiry, Mr. C. T. White, F.L.S., Government Botanist, stated that all members of the Zamia family are dangerous when considered in their relationship to stock foods. Quite a number of them occur in different parts of Queensland, some of them quite large. The one referred to in this inquiry is probably *Bowenia spectabilis*, a zamia or cycad of fernlike appearance, bearing a cone of nuts which fall round the base of the plant. Trouble in this case may be caused either through eating the young shoots of the plant, or the ripe seeds when they fall from the plants. The poisonous nature of these plants has now been proved definitely by feeding tests, and it would appear to be dangerous to allow pigs to run in country where zamia nuts are in abundance.

One of the species of zamia which occurs in New South Wales caused severe losses in travelling sheep recently. These sheep had been used to hand feeding of maize and other concentrated foods. In travelling through a patch of zamia country they ate a number of the nuts, and severe losses occurred.

If in doubt as to whether any plant or seed is dangerous, immediate action should be taken to forward specimens, roots, stems, leaves, flowers, fruits, to the Government Botanist.

General Notes.

In Memoriam.

ADAM McGOWN, M.R.C.V.S.

The death of Mr. Adam McGown, formerly of the veterinary staff of the Department of Agriculture and Stock, which occurred at Bundaberg on 23rd August, is recorded with deep regret.

The late Mr. McGown was born in the North of Scotland 59 years ago, and graduated at Edinburgh in May, 1898. After practising in Falkirk in his homeland for a number of years, he came to Queensland and entered the Public Service subsequently as a veterinary inspector and became later a Government veterinary surgeon and Quarantine officer. He qualified as an expert under the Slaughtering Act, and served also as a member of the Stallions Board for a lengthly period. Three years ago he resigned to engage in private practice in Bundaberg where he became well known for his skill as a veterinary surgeon and highly esteemed as a citizen.

While in the Department of Agriculture and Stock, Mr. McGown's professional work took him over a wide area of the State, in which his skill and advice were regarded as being of great value. He was keenly enthusiastic in all matters appertaining to his special duties, which brought him into close and intimate contact with graziers and other stock owners who held a high opinion of his abilities. His genial manner and other fine qualities won for him many friends. Many ex-students of the Queensland Agricultural College, where he lectured regularly on veterinary subjects for a considerable time, deplore his untimely passing. A lover of horses, Clydesdales had for him an especial attraction and he was a recognised authority on the breed.

At the funeral service which took place at the Crematorium, Mount Thompson, Brisbane, on 24th August, there were present, in addition to near relatives, representatives of the Department of Agriculture and Stock and of the ex-students of the Queensland Agricultural College. The late Mr. McGown is survived by his widow and a daughter, Mrs. E. Marlay, and to them deep sympathy is extended.

WIRELESS TALKS TO FARMERS.

Through a mistransposition of subjects in the radio lecture list published in our last issue, a risk of misunderstanding has arisen.

The corrected lecture list for the remainder of the present broadcasting term is, therefore, given below:—

Tuesday, 10th September—"Fungicides and Disease Control," Part III. J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 12th September—"Chloris Grasses." S. L. Everist, Assistant to Botanist.

Tuesday, 17th September—"Manures and Fertilizers." E. H. Gurney, Agricultural Chemist.

Thursday, 19th September—"Salt Bushes." C. T. White, Government Botanist.

Tuesday, 24th September—"Kilkivan to Kingaroy—An Epic of Pioneer Settlement." J. F. F. Reid, Editor of Publications.

Thursday, 26th September—"Brains in Farming." J. F. F. Reid, Editor of Publications.

Staff Changes and Appointments.

Acting Sergeant F. G. Boyle, of Mareeba, and Constable C. H. Smith, Eton, have been appointed also Inspectors under the Slaughtering Act.

Mr. E. J. Taylor, Amamoor, has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, and will be attached to the Zillmere Bacon Factory.

Mr. P. Round has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, and is attached to Pittsworth.

Mr. G. H. Curry, of Lake Barrine, and Mr. C. J. O'Brien, of Lake Manchester, have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act.

Messrs. T. P. McGrath, J. McI. Davidson, P. F. Goodwin, A. Hoffman, A. James, P. K. Garvey, and H. Armstrong—school teachers in the Cleveland District—have been appointed honorary rangers under the Animals and Birds Acts.

Mr. J. F. H. Clark, Inspector of Stock, Gladstone, has been appointed also an Inspector under the Dairy Produce Acts.

Messrs. M. H. Muller and J. W. Winlaw, Inspectors of Dairies at Mundubbera and Monto, respectively, have been appointed also Inspectors under the Brands Acts.

Mr. N. Bennett, manager, Racecourse sugar mill, has been appointed millowners' representative on the Racecourse Local Sugar Cane Prices Board, vice Mr. J. A. Michelmore, resigned.

The Officer in Charge of Police, Duaringa, has been appointed also an Inspector under the Brands Acts.

Mr. H. A. Taylor, Inspector under the Fertilizers, the Pure Seeds, the Stock Foods, the Pest Destroyers, and the Veterinary Medicines Acts, Department of Agriculture and Stock, has been appointed Inspector and Examiner under the abovementioned Acts, and Mr. R. J. Holdsworth, Assistant, under the Pure Seeds Act, has been appointed Inspector under the Fertilizers, the Pure Seeds, the Stock Foods, the Pest Destroyers, and the Veterinary Medicines Acts, Department of Agriculture and Stock.

Messrs. C. Bonne, A. Byrne, and P. C. Boettcher have been appointed Assistant Cane Testers at the Proserpine, Millaquin, and Bingera mills, respectively.

State Wheat Pool.

The State Wheat Pool Election Regulations have been amended to provide that the existing members of the Wheat Board shall be continued in office until the 31st August, 1935, and that the succeeding Board shall hold office from the 1st September, 1935.

This action has become necessary following the recent death of Mr. Booth, one of the nominees for the election of members set down for the 30th July. A fresh election has been ordered, and will be conducted on the 30th August next.

Animals and Birds Sanctuaries.

Orders in Council have been issued in pursuance of the provisions of the Animals and Birds Acts, declaring Daley's Lagoon, Upper Ripley, and Oakwood Lagoon, Euramo, the latter the property of H. N. Lund, Tully, to be sanctuaries under the Acts. Honorary rangers have been appointed in respect of Daley's Lagoon sanctuary—namely, Messrs. R. Varley (Peak Crossing) and W. B. and A. E. Hall (Ripley).

Preservation of Hides.

Regulation 36 under the Slaughtering Act, relative to the preservation and production of hides and skins, has been rescinded, and a new regulation substituted. The Regulation provides that the occupier of a slaughterhouse shall keep at the slaughterhouse the skins or hides of stock for seven days after slaughter, unless such skins or hides have been inspected earlier, and shall produce them to an inspector on demand. No skins or hides shall be removed during the period of detention, nor any brands or marks thereon defaced or removed.

Every person who slaughters stock at any place other than a slaughterhouse shall keep the skins or hides at such place for fourteen days after slaughter, unless an inspector has inspected them, and shall, on demand, produce the skins or hides to an inspector. Similarly, the skins or hides shall not be removed during the period of detention, nor shall the brands thereon be defaced or removed.

Banana Industry Protection Board.

An Order in Council has been issued in pursuance of the provisions of *"The Banana Industry Protection Act of* 1929," providing for a levy on banana-growers to be used in the maintenance of the Banana Industry Protection Board. This levy is similar to that issued last year, and is at the rate of 2d. in the £ on the net proceeds of all bananas marketed in the bunch, and 1½d. per case for all fruit marketed in the case. This levy will be operative for a period of twelve months from the 1st August next.

Dairy Products Stabilisation Act.

An Order in Council has been issued further amending section 10 of the Dairy Products Stabilisation Act. This section at present provides a penalty of £500 for an offence against the provisions thereof, and the amendment approved to-day will provide penalties for breaches similar to those applying in the Victorian Dairy Products Act.

The amendment provides that a manufacturer who, in contravention of the provisions of the section, sells at any time an amount of dairy products in excess of the amount permitted under the section, shall be liable—

In the case of butter, to a penalty of not less than £4 and not more than £6 for every cwt. or part of the excess amount; and

In the case of cheese, to a penalty of not less than £2 and not more than £3 for every cwt. or part of the excess amount.

Cream Grades.

Regulations under the Dairy Produce Acts have been amended to provide that there shall be three grades of cream, designated "Choice Grade," "First Grade," and "Second Grade," respectively.

Cream which is affected by putrefactive decomposition or is considered by the owner of a factory to be unfit for the food of man shall not be designated by grade but shall be rejected.

The basis of payment for cream graded either as choice grade or first grade cream shall be—for all cream graded as choice grade cream, the owner of the factory shall pay ½d. per lb. commercial butter content over and above the price paid by him for cream graded as first grade; and for all cream graded as first grade he shall pay 1d. per lb. commercial butter content over and above the price paid by him for cream graded as second grade cream.

Committee of Direction of Fruit Marketing.

Regulations under the Fruit Marketing Organisation Acts have been issued relative to the electorates for the election of the Banana, Pineapple, Citrus, Deciduous, and Other Fruits Sectional Group Committees. For the purpose of electing members of the various Sectional Group Committees, each of the Local Associations and groups of Local Associations set out in the regulations shall constitute the various electorates, and shall elect to hold office until the completion of the next election of members of the Sectional Group Committees the number of members respectively set opposite to the name of the Local Association or Group of Local Associations.

Dairy Products Stabilisation Board.

An Order in Council has been issued in pursuance of the provisions of the Dairy Products Stabilisation Act, extending the operations of the Dairy Products Stabilisation Board until the 30th September next. This Board consists of the members of the Butter Board, two representatives of the Cheese Board, and the Director of Marketing.

Levy on Pine Plywood.

Regulations have been approved under the Primary Producers' Organisation and Marketing Acts, empowering the Plywood and Veneer Board to make a levy at the rate of 3d. per 100 feet face measurement on all pine plywood to which the Orders in Council made under the provisions of the Acts apply and extend, delivered by a grower between the 3rd May, 1935, and the 2nd May, 1936, for the purpose of establishing and maintaining a fund for subsidising growers for plywood despatched outside the Commonwealth. This levy has already been in force, but with the extension of the Board until May, 1936, it has been necessary to also formally extend the levy regulations.

A Beerwah Sanctuary.

Timber Reserve R. 311, parish of Durundur (Beerwah district) has been declared a sanctuary for the protection of native animals and birds.

Pineapple Levy.

A regulation has been issued in pursuance of the provisions of the Fruit Marketing Organisation Act extending for a further twelve months the Pineapple Levy Regulation which was published in the *Gazette* of the 30th June, 1934, and which empowers the Committee of Direction of Fruit Marketing to make a levy on pineapples. A proviso is added this year that no levy shall be collected on single-case consignments of pineapples or upon single cases of pineapples which form part of a consignment with other fruits.

Peanut Board.

An election for the appointment of a grower's representative on the Peanut Board for Districts Nos. 1 and 2 (Wienholt and Nanango) and Central Districts will not be necessary this year as the present members, Messrs. C. F. Aderman, Wooroolin, and R. R. Nothling, Hut Creek, Ambrose, have been returned unopposed. They will be reappointed for a further term of two years as from the 28th August.

The Passing of a Great Agriculturist—Walter Scott Campbell.

The death of Mr. Walter Scott Campbell at Sydney on 25th July removes one of the founders of Australian agricultural policy and the last original pupil of Sydney Grammar School. Although Mr. Campbell was in his 92nd year, he had taken a keen interest in agriculture, natural history, and horticulture up to the time of his death. Physically well preserved and endowed with a remarkably retentive memory, Mr. Campbell made his first trip to England at the age of 90. His last public service was quite recent, when he prepared a report for the consideration of the Commonwealth Wheat Commission.

In 1877 he reported extensively on agricultural conditions in New South Wales, being the first expert to indicate the dairying possibilities of the North Coast.

The son of Francis Campbell, a noted physician of early Sydney, Mr. Campbell was a native of Maitland, and was born in 1844. He attended a school at Parramatta conducted by Dr. William Woolls, and later became No. 17 boy at Sydney Grammar School, of which he was the last surviving original pupil.

After the introduction of Sir John Robertson's Free Selection Act there was urgent need for the training of young surveyors, and Mr. Campbell was one of those chosen for the work. In 1861 he joined the Government service as a temporary cadet, and thirteen years later had been promoted to successive positions, until he became chief draughtsman. In 1893 he was appointed chief clerk in the Department of Agriculture and Forestry. Subsequently he was appointed chief inspector of agriculture, and in 1903 director of forests and agriculture, a position he held until his retirement in May, 1909.

It was mainly due to his efforts that the New South Wales system of experiment farms was established. He co-operated strongly with William Farrer in his wheat-breeding experiments.

After his retirement Mr. Campbell conducted a mission of inquiry on agricultural prospects in the Northern Territory on behalf of the Government. During a recent tour abroad Mr. Campbell studied the methods of agriculture in other countries, and recalled how, at El Cantro, on the Mexican border, he visited a Government experiment farm, and upon inquiring the name of the wheat which was growing in one of the experimental rows, he was informed to his great surprise that it was White Federation. This variety, now world famous, was evolved by Farrer in New South Wales, to take the place of Steinwedel, then largely grown in dry districts.

Mr. Campbell was a past president and fellow of the Royal Australian Historical Society, for which, when not in his garden, overlooking Vaucluse road and Sydney Harbour, he delighted in writing historical papers.

Mr. Campbell was also keenly interested in agricultural development and progress in Queensland, and was a regular reader of this Journal, with which he maintained a valued correspondence.

Butter and Cheese Boards.

Orders in Council giving notice of intention to extend the operations of the Butter and Cheese Boards until the 30th September next have been issued.

Rural Assistance Board.

An Order in Council has been issued, in pursuance of the provisions of "*The Rural Assistance Board and Agricultural Bank Acts Amendment Act of* 1934," constituting the Rural Assistance Board and appointing the following to be members of such Board as from the 1st August, 1935:—

Messrs.—

H. C. Quodling (General Manager, Agricultural Bank), Chairman;

R. Wilson (Assistant Under Secretary, Department of Agriculture and Stock), Deputy Chairman;

A. C. Palmer (Manager, Head Office Staff, Agricultural Bank); and

R. L. Murray, A.F.I.A. (Senior Inspector of Accounts, Audit Office).

Extending Operations of Butter and Cheese Boards.

Orders in Council have been issued, in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, extending the operations of the Butter and Cheese Boards until the 30th September, 1935, and continuing in office until such date the present members of such Boards. These are:—

Butter Board.

Messrs. J. Purcell (Toowoomba) (chairman), W. J. Sloan (Malanda), R. M. Hill (Bororen), J. McRobert (Maryborough), T. F. Plunkett (Beaudesert), A. G. Muller (Fassifern Valley, Kalbar), and E. Graham (Director of Marketing).

Cheese Board.

Messrs. H. T. Anderson (Dalby) (chairman), T. Dare (Narko), A. J. Harvey (Pittsworth), D. G. O'Shea (Southbrook), A. Pearce (Coalstoun Lakes), and E. Graham (Director of Marketing).

Pioneer Mill Levy.

Regulations have been issued, in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, empowering the Pioneer Mill Suppliers' Committee to make a levy at the rate of thee-farthings per ton on suppliers of sugar-cane to the Pioneer mill, for the purpose of defraying the costs of employing a farmers' representative at the mill. Fifty per cent. of the suppliers to the Pioneer mill may lodge a petition, on or before 23rd September, on the question as to whether the levy shall be made.

Council of Agriculture.

The regulation issued on the 25th July last, covering the personnel of the Council of Agriculture, and made in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, has been amended to provide that the Barley Board's representative on the Council shall be Mr. Edward Fitzgerald, of Felton.

Sanctuary at Darlington.

The property of Mr. N. C. Markwell, at Darlington, near Kerry, has been declared a sanctuary for the protection of native animals and birds, and Mr. Markwell has been appointed an honorary ranger in connection therewith.

Barley Board.

An Order in Council has been issued giving notice of intention to extend the operations of the Barley Board for the period from 24th April, 1937, to 23rd April, 1942. A petition for a ballot on the question as to whether the Board shall be continued may be lodged on or before the 16th September.

Close Season for Quail in Southern Queensland.

An Order in Council has been issued, in pursuance of the provisions of the Animals and Birds Acts, varying the close season for quail in Southern Queensland by providing that it shall commence on 1st September, 1935, instead of the 1st November, 1935.

Rural Topics.

God, The Creator.

"Beholding, and mindful of all this great wealth, there rings with these thoughts also the thought that there is much here that suggests God the Creator reveals some features of His Power, His Wisdom, and His Goodness.

"Back of the loaf is the wheat and the flour,
And back of the flour the mill,
Back of the wheat is the sun and the shower,
The rain and the Father's will."

—From the official address of welcome to the Governor, Sir Leslie Orme Wilson, on the occasion of the opening of the Brisbane Show.

Boar Weighs 896 lb.

"What a size! How can he move about? How much does it take to feed him? What a whopper!" These remarks were overheard near the pen of Norfolk King David V., a hugh Large White boar, the property of the Gatton Agricultural College, and exhibited at the Royal National Show.

The boar weighs 896 lb. and was champion of the Exhibition last year. Many a prime bullock does not come up to his weight. In the awards he was unplaced this year, but his son, Gatton David, owned by Mr. J. A. Heading, of Murgon, secured first prize and the championship. Gatton David is nearly as heavy as his father, his weight being estimated at 800 lb.

A Good Litter of Large Whites.

Mr. and Mrs. A. G. Stewart, of the Cedar Pocket district, Queensland, have sent us in the following record of the litter of their large white sow "Lady Fay," the litter being two months old at date of first weighing. Individual weights:—Boars: 43, 49, 46, 35, 37, 38 lb.; sows: 44, 45, 40, 48 lb.; a total weight for ten pigs of 425 lb., an average weight of 42½ lb. at two months of age.

These pigs did not have what is usually referred to as special or expensive feeding, but they had the benefit of the milk from the sow, plus a balanced cereal mixture, fed *ad lib.*, as the young pigs required it.

The litter was farrowed on 22nd May, 1935, and consisted of eleven pigs, of which one was killed at birth. This is a good record for pigs at the age stated.

A Cheap Paint for Iron Roofs.

Because of the continual contraction and expansion, as the result of extremes of heat and cold, and the absence of good grip or key, ordinary house paint is not suitable for galvanised iron roofs, and it is always advisable to use paint specially manufactured for the purpose. A cheap paint for corrugated iron roofs may be made by mixing together 14 lb. of cement to 1 gallon of boiled linseed oil. This should be kept thoroughly stirred and applied in warm weather.

Horses—Watering Hints.

Right throughout the summer season the horses that are working require considerably more water than at other times, and if denied plenty of water suffer just as acutely from lack of a drink as does a human being under the same circumstances. Now there is a considerable difference of opinion as to how horses should be watered during hot weather, and in many cases drinking is not allowed whilst at work or at times whilst sweating.

The best plan to follow, however, is to never let the horse become unduly thirsty, but to allow to drink frequently, when the weather is really hot, whilst actually at work.

To keep the animal off water for some hours whilst hard at work, and then to allow of drinking freely, is quite apt to cause stomachic trouble, but when allowed to drink frequently, and as much as may be desired, no trouble will be set up, and the animal will work all the better for the concession, and will also benefit in health. —J. T. B. in "Farm, Field, and Fireside"—(England).

Stockowners Warned Against "Cure-alls."

From time to time advertisements and reports of lectures have appeared in the press urging dairy farmers to administer drenches to their cows at various periods, but particularly in connection with calving and the suspected occurrence of various infectious diseases. Generally, no information is supplied indicating what the drench consists of, nor what particular abnormal condition it is supposed to remedy.

The Department of Agriculture (N.S.W.) has frequently drawn the attention of stockowners to the undesirable habit of indiscriminately giving to cattle drenches of unknown contents without expert advice. The normal, properly fed and managed animal should require no medicine whatever, either in the shape of a drench or any other form. If the animal is ill, then appropriate drugs in drench or other form may be utilised to overcome distressing symptoms and to assist in rectifying deranged conditions in the internal organs, but these drugs must be administered with some regard to the actual condition existing.

The wide claims made in connection with many drenches should be quite sufficient to render stockowners dubious; many border on the miraculous. If, for instance, a claim is made for a certain drench that "it is of great value in cases of constipation" and nothing more, then the claim might be accepted as it is probably true. If, on the other hand, the drench is claimed to be a "sure cure for constipation, diarrhœa, all blood diseases, spavin, and cough," then the stockowner should seriously ask himself whether such claims are possible.—"A. and P. Notes," N.S.W. Department of Agriculture.

The Waler in India.

It is not only as a remount that the Australian horse exercises a leading role in India, but in the show ring and in the field of sport he is also well to the fore. At the Delhi Horse Show for the past two years the champion saddle horse was an Australian owned by H.E. the Viceroy of India.

In recent years enthusiastic efforts have been directed towards the breeding and improvement of the horse in India. A number of Government studs have been formed which are mostly under military supervision. For this purpose stallions have been imported from England, and a few from Australia.

Arab stallions are also employed in the scheme. In view of the hardiness of the Waler (despite the fact that it is contended he is not equal to the standard of past days) it is a matter of surprise that more stallions are not secured from Australia. One would think that horses bred and reared under the conditions ruling here would be more suitable than sires introduced from England. They would acclimatise better and quicker than those hailing from a cold country, while in comparison with the rearing of thoroughbred stallions in England the Australian product should stand up to conditions in India better than his English brother.

If our utility horses are the most suited to the needs of the army in India, surely the male source from which they sprung should also be best suited for the improvement of the native horse stock of India!—"Country Life."

Disappearing Wild Life—Pests Increase.

Mr. A. S. Le Souef, Curator of Taronga Park, in an address at a recent meeting of the Rangers' League, deplored the rapid extinction of wild life—the end of the age of wild animals. He said that Governments must try to stem the exploitation of the heritage of wild animals.

The beautiful big grey kangaroo, one of the most typical of Australian animals, might be said to live on sufferance, he said, as all the land on which it lived had been taken up for settlement. The koala might be said to be living only in the same way. The introduction of the fox had resulted in ground animals being cleared out. In the bush the mistletoe was spreading and doing enormous damage by killing trees, whereas formerly the native animals had been numerous enough to keep the balance. He believed that opossums and koalas ate the seeds of mistletoe, and their disappearance had allowed it to go ahead. Quail, which ate the blowfly, so destructive in Australia, were shot in large numbers. Wonderful areas had been set apart for the preservation of game, but they meant absolutely nothing, as there was nobody to police them. In the clearing of the forest lands properly proportioned breaks should be left so that birds could nest, and magpies and various others could eat the grasshoppers. The grasshopper pest of last year was one of the results of the destruction of bird life.

International Committee for Inter-Co-operative Relations.

The Seventh Session of the International Committee for Inter-Co-operative Relations was held at the International Labour Office in Geneva during the last quarter of 1934.

This committee was established as a result of the examination by the World Economic Conference of 1927 of the whole question of improving the agricultural situation. The conference had found that the position of the farmer was bound up with the general problem of economic rationalisation, and that an appreciable change could be brought about by creating effective links between agricultural and distributive co-operative societies. Accordingly, it had passed a resolution calling attention to the importance of inter-co-operative relations. As this resolution was in harmony with the aims of both the International Co-operative Alliance and the International Commission of Agriculture, these two organisations took the initiative of setting up the International Committee for Inter-Co-operative Relations.

Since its constitution, the committee has set itself the task of encouraging the formation of national groups composed of both agricultural and distributive co-operative societies, wherever it has seemed advisable to do so. In its first six sessions, it also undertook studies of various important problems relating to the marketing of wheat, eggs, and dairy produce—the last-mentioned item with particular reference to the New Zealand Produce Association. At its seventh session, the committee expressed its satisfaction at the constant increase in the number of organisations carrying on national inter-co-operative activities, and took steps to ensure closer contacts with these organisations. It considered the work of co-operative wheatstoring societies in France as well as the measures taken under the milk marketing schemes in England, Northern Ireland, and Scotland. The committee then decided upon a survey of the various forms of intervention practised by public authorities in the organisation of the marketing and distribution of agricultural produce, and upon an examination of the effects of such intervention on the development of co-operative organisations. An inquiry into the part played by agricultural and distributive co-operative societies in the national and international butter trade was brought to a conclusion; and the committee made a series of recommendations for a better regulation of local, national, and international marketing in the interests of the producers and consumers of agricultural products. A draft arrangement calculated to promote joint action between the International Co-operative Wholesale Society and the International Commission of Agriculture was also approved.

The Value of Silage.

The market value of silage is not fixed, as is the case with hay. In nearly every case the fortunate farmer who possesses it regards it as of so much value to himself that he will not sell it. It has, however, a very definite market value. Considered from the point of view of its actual food constituents it may not be so valuable as hay, but its succulence is an important feature, and renders it of considerable value, particularly in time of drought, when succulent feed is the very class of which there is a special scarcity.

Farmers are beginning to appreciate the real monetary value of a supply of silage—not merely its value as fodder, but the profits accruing from the enterprise made possible by the reserve of feed.

Propagation of Saltbush.

The re-establishment of saltbush is no more difficult than the laying down of pastures, judging by the experience of Mr. D. A. Wettenhall, of Jerilderie (N.S.W.). Up to the present, the usual method of propagation has been to raise seedlings in nursery plots and transfer the young plants to their permanent positions. This is slow, and often involves a high percentage of losses.

According to Mr. A. W. S. Moodie, Assistant Agrostologist, New South Wales Department of Agriculture, all Mr. Wettenhall did was to collect the seed, disc and harrow the area immediately before sowing in early May, and use the wheat drill for distributing the seed. The seed germinated as freely as Wimmera rye grass, and an excellent stand has been obtained.

Mr. Moodie holds that the plan adopted by Mr. Wettenhall indicates that it is practicable to establish large areas of saltbush provided the individual is willing to harvest his own seed and to protect the sown areas from stock until the plants are well grown. Strips planted along the fences and protected by temporary wires would provide an excellent drought standby. This was the method adopted on the Jerilderie property.

Points of a Good Laying Hen.

The main outward indications of a good layer are large, prominent eyes, giving an alert appearance, face free from wrinkles and undue feathering, skull fairly fine yet strong, body deep and wide showing capacity and stamina, and an active robust appearance.

On being handled, the abdomen of birds which are in laying condition should be full and soft, the skin being of fine texture and the pelvic bones fairly wide apart, thin and pliable; but too much stress should not be placed upon the condition of the pelvic bones, as many good layers would not stand up to such a test as applied by those who rely mainly upon this factor in selection. The condition of the abdomen and pelvic bones is largely dependent upon whether the bird is actually laying or not. When in full lay the whole abdomen is expanded, but as soon as she ceases laying, even temporarily, there is a contraction of these parts, and this must be taken into consideration in handling the birds.

Saltbush Propagation Experiments.

From the comments of Mr. A. W. S. Moodie, Assistant Agrostologist of the New South Wales Department of Agriculture, on an experiment conducted by Mr. D. H. Wettenhall, of Jerilderie, and to which reference was made in a recent issue of the "Sydney Morning Herald," it seems at least a distinct possibility that present-day methods of sowing ordinary crop plants may be successfully employed in regard to the saltbushes in low-rainfall areas.

Mr. Wettenhall was convinced that the saltbushes were worthy of attention for pasture improvement purposes, and especially the "Old Man" species, Mr. Moodie said. He collected several bags of seed, and, using the wheat drill for distributing the seed, succeeded in obtaining an excellent stand. The land was disced and harrowed immediately before the sowing in early May. The seeds had germinated as freely and readily as would be the case with grasses such as Wimmera rye grass.

Mr. Moodie said that, in the past, many graziers had attempted to establish saltbushes by raising seedlings in nurseries, then transferring the young plants to the grazing paddocks. The area which could be treated in this way was necessarily limited. Many plants died, and it was difficult to protect them from stock. Consequently, while all admitted the great value of the plants, few serious attempts had been made to re-establish them on areas where they had formerly flourished.

The methods used by Mr. Wettenhall indicated that it was practicable to establish large areas of saltbush provided the individual was willing to harvest his own seed and to protect the sown areas from stock until the plants were well grown. Strips planted along the fences and protected by temporary enclosures would provide an excellent drought standby. This was the method adopted in the present instance.

Wool Classing.

All wool, whether merino, comeback, or crossbred, when evenly classed, sells better than irregularly classed clips. It is important to have medium quality merino fleeces packed separately from those of fine quality. Strong, straight-haired merino fleeces should be kept apart from the other sorts, and should be packed separately regardless of th fact that they may be of good length and weight. Heavy yolky and black-tipped fleeces should be packed separately from the best wool of a clip. Buyers complained last season, say the brokers, that in some cases heavy conditioned fleeces had been packed in the top lots. The greatest care should be taken to have the various lots of comeback and crossbred clips kept as even as possible for quality and length.

Buyers also complained last season of the lack of care in skirting the fleeces of some of the smaller clips. The principal complaint was that locky and inferior pieces adhered to many of the fleeces. Deeper and more careful skirting, particularly around the breech, is recommended.—"The Australasian."

A Red Poll Cow's Record.

A Red Poll cow in the Ranksborough herd of Mr. Owen H. Smith, of Langham, Oakham (England), who is president-elect of the Red Poll Cattle Society, has established a breed record. His nine-years-old cow Basildon Rosalind 3rd has with her last three calves given 52,589½ lb. of milk, her last three records being 20,960¾ lb. in 1934, 19,083¼ lb. in 1933, and 12,554 lb. in 1932. In weight this means 23 tons 9 cwt. of milk in three years, which is a good performance for a cow of the dual-purpose breed.

To Bend Metal Pipes.

Get some dry, clean sand. Prepare a tapered wooden plug and drive tightly into one end of the pipe, after making sure that no foreign substance is in it. Stand on end and pour in sand, tapping gently to get it down until it is filled to within an inch of the top. Make a dozen or fifteen thin softwood wedges 6 inches long, and drive them 4 inches into the piping until the end is completely blocked, so that the sand cannot escape. The piping is now, to all intents, solid, and may be heated, and bent to the desired angle like ordinary bar iron. Do not use damp or wet sand, or when it is heated it will burst the piping or blow out the plugs.

Value of Pig-Recording.

A very successful pig breeder of the Waikato, New Zealand, Mr. C. P. Harington, is a staunch advocate of pig-recording, and at a recent meeting of breeders he stressed the vital importance of this great aid to maximum production. Pig-recording, said Mr. Harington, was the medium by which was measured the prolificacy of sows. In the Waikato Recording Club 2,500 sows had been recorded, and after four years weaner weights had been increased up to 48 lb., which was truly a remarkable figure in comparison with the figures of other countries. That had been achieved by the use of meat meal and by creep feeding. The heavy weaner was the key to successful production. Unless there was a record of performance behind them, pedigrees were not worth anything, for production was the only true gauge. Farmers who had recorded were now far ahead of those who had not. Pedigree plus performance would always pay better than pedigree alone. If breeders did not record they were working in the dark. The new Waikato Pig-recording Association would put recording on the map, and the work would become as indispensable as herd-testing.

Stock Transport by Motor Truck.

A writer in "The Australasian"—H.B.J.—gives the following interesting account of the transport of twelve steers in a motor truck over a distance of 600 miles:—

An indication of the potentialities of the motor truck for transport of cattle over long distances in country not served by railways was recently provided by an interesting transport experiment. With the object of ascertaining how cattle would travel by motor truck, 12 steers were transported in a motor truck from near Mount Leonard Station, in Central Australia, to Broken Hill, a distance of 617 miles. The journey was accomplished in the fast time of three days, and the cattle were delivered at Broken Hill in good condition. If the beasts had been brought down by road the journey would have taken about ten weeks, but in this case, owing to the existing drought conditions, the steers, because of lack of feed en route, would have perished on the way to Broken Hill. It is claimed that this is the longest distance that cattle have been transported in Australia by motor vehicle.

The experiment was conducted on behalf of the Mount Leonard Pastoral Company (Q.), the transportation being carried out by Glassons Motors, of Broken Hill. This firm had a special body fitted to a 10-ton Leyland truck. The vehicle is a six-wheeler, equipped with 10-inch sectioned Dunlop tyres, thus ensuring comfortable and speedy travel over rough tracks. The tare of the 43-h.p. truck is 9 tons, and, with the cattle aboard, about 18 tons. The outfit, with its live load, left Mount Leonard at 11 a.m. Friday and was in Broken Hill (617 miles) on the following Monday at midday. According to the stock inspector (Mr. G. B. Johnston), the steers arrived in beautiful condition, suffering no ill-effects from their long journey by motor.

The success of the undertaking is one of vital interest to pastoralists far removed from railheads, and particularly those located in parts of the hinterland subject to droughts. It is of interest to mention that a 6-ton Brockway truck with an articulated trailer carrying a special two-tier body, 25 feet long by 10 feet wide, is also being used very successfully by Glasson Motors for transport of sheep over long distances. The outfit is equipped with 10½-inch sectional Dunlop balloons on the front axles and twin 8-inch Perdriaus on rear axle of truck. The trailer axle carries wheels with 10-inch Perdriaus, the object of the big tyres being the elimination of jolting and shock while carrying loads of sheep over long stages. At present this outfit is transporting about 1,000 sheep a week, the two-deck body comfortably holding from 250 to 300 sheep. These travel distances up to 300 miles in good shape.

The opinion of those associated with this transport experiment is that in the near future the motor truck, with suitably equipped special bodies, will be used extensively for carrying live stock from outlying districts.

PLATE 127.—LOOKING ACROSS LAKE COOTHARABA FROM HOMES POINT, SOUTH QUEENSLAND.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planed in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

A NEW DANGER TO CHILD-LIFE IN QUEENSLAND.

THE greatest danger to our children is that so many of them are badly fed. You may give a child as much food as he can eat, his appetite may be satisfied, but he may be ill-nourished and have a very poor resistance against disease. So long as you keep to the simple natural foods in right proportions, you are safe. To feed children on artificial processed foods is always dangerous, and many suffer from this. Recently there has been introduced into Queensland an artificial food more dangerous than any we have had before, and specially dangerous to Australian children, because so many of them get too little milk, and many depend on butter to supply that deficiency.

The Virtues of Milk.

The chief virtues of milk are three. (1) It is the best source of lime, which is necessary for the growth of bones and teeth. Cow's milk contains more lime than does lime-water. (2) It contains the most valuable proteins (body-building food). (3) It contains good quantities of the vitamins A and D. Vitamin D is necessary to prevent rickets, not an uncommon disease in Queensland. Lack of Vitamin A causes many diseases—inflammation and suppuration of the eyes, pneumonia, ulceration of the stomach and bowels, stone and suppuration of the kidneys, and other serious and fatal illnesses. There is no food that will replace milk for children, but these two vitamins are contained in butter.

Why Butter is a Peculiarly Important Food in Australia.

Unfortunately most Australians do not believe in milk for themselves, and many do not know how important it is for their children. They don't like milk, but they do like butter, and this favourite food is not stinted, when they can afford it.

Dripping as a Substitute.

If a mother cannot afford to buy enough butter for her children she should substitute dripping for some of it. Dripping is very cheap and contains both vitamins, though in smaller proportions than does butter. If the children have good digestions for fat, they can get a fair amount of the vitamins from dripping. Some do not like dripping and are tempted to buy margarine, which may be substituted for butter without the children knowing it.

The Margarine Menace.

Margarine is a mixture of vegetable and animal fats. It has no fixed composition, and the manufacturer can vary it at will. The vegetable fats are for cheapness; some animal fat and perhaps a little milk or

butter is worked in to give it the right taste, and it is carefully coloured to look like butter. There is nothing harmful in margarine itself, but to give it as a substitute for butter is extremely dangerous.

They found this out in Denmark. In that country during the war butter went to such a high price that the farmers sold every bit of it. Their own children were fed on skimmed milk and margarine. The results were terrible. The children were poorly nourished and fell ill. Many lost one or both eyes from inflammation. Many died. A medical inquiry discovered the reason for this terrible illness, and that it could be easily prevented by giving whole milk, butter, or cod liver oil to supply the vitamins. These were the worst cases. A slighter degree of shortness of vitamins causes a condition that may be difficult to detect, but is serious. Such cases are already present in Queensland, and the use of margarine will make them more numerous and more serious.

There is at present no law to prevent margarine being coloured to look like butter; consequently it is the duty of every mother to protect her children against this new and real danger. Do not wait until we suffer from an outbreak of illness so dreadful as they had in Denmark.

IN THE FARM KITCHEN.

POTATO TIPS.

It is much easier to peel potatoes in warm water. Before they are fried or baked they should be dried in a cloth.

Champ.

This is a Northern Ireland dish, and often served alone:—Boil some potatoes, mash them with hot milk and butter, mix some cooked peas, and small onions with the potatoes. Serve with pepper and salt. (In the case of the peas, use fresh if you have them, otherwise tinned or dried will do.)

Anna's Potatoes.

This is a French way of cooking potatoes, and is called Pommes Anna by the French people. Butter a pie dish, or basin, or cake tin; peel and cut some potatoes very thin, wash and dry them, and mince some onions very fine; put a layer of the thin slices of potato in the dish, each slice singly and overlapping the other until the bottom of the dish is quite covered; add a thin layer of minced onion, season with pepper and salt, and sprinkle with a very little butter.

Repeat these layers until the dish is full, pressing each layer down firmly. Bake in a moderate oven for one hour. Turn out. It should be a nice firm cake, and should be cut in wedge-shaped pieces like a cake.

A little grated cheese sprinkled over each layer and on top turns this into a very delicious dish for supper or high tea.

Made only with potatoes, onions, and seasoning, this pie is delicious, with either cold or hot roast meat.

Potato Pancakes with Cheese.

Peel and grate six raw potatoes; season with salt and pepper, moisten with a teacupful of milk, and mix the whole with three yolks of eggs, 1 oz. butter, and a breakfastcupful of breadcrumbs. Then add four tablespoonfuls of grated cheese and enough flour to make a smooth batter. Fry in a frying-pan in a little more butter or bacon fat than is used for sweetpan cakes. When browned on both sides, dust the top with grated cheese, fold, and serve.

Potato Cheese-cake.

Wash and mash about four potatoes with 2 oz. sugar, 2 oz. butter, one egg, lemon peel and lemon juice to flavour. Use to fill pastry-lined patty pans, as you would lemon curd.

THE GARDEN COMPOST HEAP.

THE garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops free of disease, vegetable tops, &c., should all be used in this manner, but the coarse, woody stalks of strong-growing plants should not be used.

The production of artificial manure from garden waste, straw, &c., consists in the decomposition, by fungi and bacteria, of much of the plant material. The nitrogen in the process is converted from an inorganic to an organic form, and is present in increased amount in the material finally produced. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity and chemical composition, and by the presence of nutrients such as lime, phosphate, nitrogen, and potash, for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. This damage is due largely to a lack of available nitrogen in the soil. Such poor-quality materials as bush scrapings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi, which rapidly increase in numbers, and in so doing consume all the available nitrogen. This competition for soil nitrates results in the nitrogen starvation of crop plants.

The usual process of allowing plant refuse to decay without any chemical treatment results in a very acid product, providing no immediately available nitrogen. With nitrogen-poor plant residues it becomes necessary to add available nitrogen to the heap, as well as lime, which prevents the development of acidity, and phosphate, which is required in the nutrition of the organisms. With nitrogen and mineral-rich materials such as legumes (peas, beans, &c.), green vegetable tops, and other green succulent material, the use of lime alone should be sufficient to enable rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base, and of such size that the final height is about 3 feet. Spread the chopped-up material in layers several inches deep, treating each layer in the following manner:—

Snow over with ground limestone (5 lb. per 100 lb. material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia may be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, so that it will not be lost. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at the full height, after subsidence due to compaction and loss of material by bacterial action, the heap can ferment under the untreated capping, which can be used as a base for the next heap. The heap should be kept damp, but water should not be added in quantity sufficient to cause drainage from the heap.

In summer the material should be ready for use after two months, but in cold weather the process is much slower.

Artificial manure properly prepared is very similar in chemical composition to composted horse manure, and gives equally good results in promoting plant growth.

FERTILITY OF THE HOME GARDEN.

INTENSIVE gardening demands a higher degree of soil fertility than does ordinary field crop culture. An efficient system of soil management should not only make allowance for the present crop, but should aim at an ever-increasing reserve of fertility. It should determine the necessity and value for the particular soil of organic matter, how most economically to apply this material, then attempt to supplement this where necessary, by liming and the addition of artificial fertilizers.

Organic matter has an important function in the growth of plants as a source of carbon dioxide, in improving the physical condition of the soil, in increasing the water-holding capacity, allowing root penetration, and modifying extremes of soil temperature. In addition to providing some of the mineral constituents required in greatest amount, organic matter provides certain rare and little understood elements, usually not considered in the preparation of artificial fertilizers. Heavy

soils in which the fine particles accumulate in large masses, and crack badly on drying, can only be improved in texture by liming when acid, and the addition of organic matter to prevent the clods from cementing.

In general, the richer the food of animals in fertilizing substances the richer their excreta, particularly the liquid portion. This contains most of the potash and a great deal of the nitrogen, but only a small amount of the phosphate which passes through their bodies; further, it contains these substances in a form ready for the immediate use of the plant. It is therefore important to realise that unless precautions have been taken to include it with the solid excreta, most of the valuable fertilizing constituents have been lost.

The kind of animal affects the fertilizing value of manure. Horse manure is richer and more readily decomposed than cow manure, since the mineral requirements of the milking cow are much greater than those of the horse. Poultry manure, when fresh, is a rich fertilizer compared with horse or cow manure; it contains more than twice as much nitrogen and phosphate, but has only about the same amount of potash. The bulk of its nitrogen is present in an easily available form, hence it is a quick-acting or forcing nitrogenous manure.

Animal manure as commonly procurable has not been carefully conserved against the loss of fertilizing constituents, and unless the liquid portion has been included, a considerable portion of the nitrogen present is not of use to plants. It must be regarded as an unbalanced fertilizer, and the fertilizer balance can be greatly improved by the separate use of superphosphate, and sulphate or chloride of potash.

Where the organic matter of the soil is maintained by using manure, a degree of fertility will be maintained, but an annual application of 100 to 150 lb. per 100 square feet will be necessary.

LIME FOR THE GARDEN.

LIME fulfils many functions which are essential to soil fertility. Its most useful action is in neutralising the acidity of strongly acid soils, for with the removal of acidity the other valuable effects of liming follow. Lime improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier, and is an essential plant nutrient, and when present in sufficient amount promotes many phases of bacterial activity, especially those ultimately bringing the reserves of nitrogenous material in the soil into the soluble forms of nitrogen which plants utilise.

There is no foundation for the common statement that exposure of acid soil to sun and air "sweetens" or reduces its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or by the loss of lime, through leaching, and absorption by plants. Acidity thus developed can only be counteracted in field or garden practice by the use of some form of lime. The forms of lime used for counteracting soil acidity are hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked lime is formed by the action of water on burnt or stone lime, and forms a very fine powder which can be efficiently spread. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, and can nearly always be relied on to give as quick and good results as slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of carbonate of lime are required to supply as much "effective" lime as 3 lb. of slaked lime contains.

The soil to be limed should be dug over and reduced to good tilth, the lime uniformly spread, and then lightly worked into the top several inches of soil. The amount of lime to be used depends on the degree of acidity of the soil, its texture, organic matter content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime that it is necessary to add to a soil can only be approximate.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1½ lb. ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or still more sandy soils can receive lighter dressings of approximately half the amount for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not always necessary to add sufficient lime to completely neutralise soil acidity, as most garden plants grow well on slightly acid soils. This slightly acid condition will only result in the majority of garden soils after liming. Only for those plants listed below as very sensitive to acidity is it advisable to completely neutralise acidity. Whilst many plants grow best on neutral soils or on slightly alkaline (opposite of acid) soils, a considerable number of plants will tolerate fairly acid soils. The latter are not adversely affected by being grown in limed soils, though many plants which require a good lime supply may fail on acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes, which will grow on acid soils, do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

Very Tolerant.—Parsley, potato, radish, strawberry, sweet potato, tomato, cowpea, maize, millet, oats, rye.

Tolerant.—Bean, Brussels sprouts, carrot, choko, cucumber, endive, kohl rabi, pea, pumpkin, rhubarb, squash, turnip, watermelon, crimson clover, vetch.

Sensitive.—Broccoli, cabbage, cauliflower, eggplant, sweet corn, barley, rape, red clover, sweet clover, wheat, white clover.

Very Sensitive.—Asparagus, beet, celery, lettuce, onion, parsnip, spinach, lucerne.

Evidence is available to show that excess of lime under certain conditions may depress plant growth. Overliming may result when the calculated amount of lime is applied to the surface zones of soil, and not worked to the proper depth. Overliming injury is produced only on heavily-limed acid soils, and not on non-acid soils, or soils which have previously been limed. This injury is not permanent and is usually overcome by the time the first crop is removed. Lettuce and lucerne are crops which may suffer from bad lime distribution.

Large additions of organic matter such as compost, manure, &c., are very effective in reducing overliming injury, and this fact is of importance in indicating that a liberal addition of green or stable manure should be applied to the soil if immediate liming and seeding are necessary. Where very heavy dressings of lime are necessary, it may be advisable to apply lime in two successive seasonal applications. After the preliminary liming, the lime added in a well-made compost will go far to counteract natural losses of lime from the soil.

POTATO INSPECTION.

Following a conference between the Ministers for Agriculture of Victoria and Queensland a few months ago, an interchange of departmental experts has been arranged in an effort to overcome the problem caused by the refusal of the Queensland department to accept certificates of cleanliness and quality for Victorian potatoes issued by officers of the Victorian Department of Agriculture. An officer of the Queensland department is already in Melbourne observing conditions under which certificates are issued in Victoria and the methods of loading and transport. The senior inspector of the Victorian department (Mr. N. McKay) was in Brisbane during August and will report on the methods employed here. When the reports of both officers have been received and their suggestions considered, an agreement is likely between the two States. It is thought that the Victorian department will be asked to modify its system of inspection and issue of certificates. Victorian growers have complained that the sending of potatoes to Queensland cannot be continued unless the Victorian certificate is final. They regard the risk of sending potatoes to Queensland only to have them refused admittance by the Queensland inspectors as too great.

PLATE 128.—THE FERTILE [illegible] VALLEY ON THE NEAR NORTH COAST, Q.

Orchard Notes for October.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Grape vines require careful attention, and if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during the month. See that the land is properly prepared and that good, healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with Bordeaux mixture and lime sulphur according to the schedule recommended by this Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm Notes for October.

Field.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

PLATE 129.—BERRY-LADEN COFFEE PLANTS ON A BUDERIM MOUNTAIN ORCHARD.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the month of June, in the Agricultural Districts, together with Total Rainfall during 1935, and 1934, for Comparison.

Divisions and Stations.	Average Rainfall. July.	Average Rainfall. No. of Years' Records.	Total Rainfall. July, 1935.	Total Rainfall. July, 1934.
North Coast.	In.		In.	In.
Atherton	1·02	34	0·34	1·61
Cairns	1·55	53	0·41	1·25
Cardwell	1·37	63	0·50	1·38
Cooktown	0·95	59	0·06	0·25
Herberton	0·86	49	0·07	1·43
Ingham	1·56	43	3·94	3·16
Innisfail	4·62	54	3·31	5·29
Mossman Mill	1·25	22	1·32	1·71
Townsville	0·62	64	0·59	0·81
Central Coast.				
Ayr	0·69	48	0·78	0·52
Bowen	0·95	64	0·34	0·32
Charters Towers	0·63	53	1·75	0·69
Mackay	1·71	64	1·46	0·59
Proserpine	1·59	32	0·52	1·65
St. Lawrence	1·38	64	3·13	0·68
South Coast.				
Biggenden	1·37	36	2·85	2·13
Bundaberg	1·80	52	5·37	1·45
Brisbane	2·24	84	2·06	5·11
Caboolture	2·19	48	2·59	4·47
Childers	1·67	40	3·99	1·40
Crohamhurst	2·96	42	5·11	6·16
Esk	1·97	48	2·44	3·15
Gayndah	1·46	64	2·21	2·03
Gympie	2·14	65	2·82	2·64
Kilkivan	1·62	56	1·54	2·72
Maryborough	1·89	64	3·86	2·17
Nambour	2·68	39	4·30	4·05
Nanango	1·67	53	1·49	3·26
Rockhampton	1·75	64	4·28	0·42
Woodford	2·38	48	2·95	3·86

Divisions and Stations.	Average Rainfall. July.	Average Rainfall. No. of Years' Records.	Total Rainfall. July, 1935.	Total Rainfall. July, 1934.
Central Highlands.	In.		In.	In.
Clermont	1·00	64	3·70	0·33
Gindie	1·08	36	3·49	0·75
Springsure	1·17	66	4·51	1·17
Darling Downs.				
Dalby	1·74	65	1·52	2·78
Emu Vale	1·59	39	1·66	3·16
Hermitage	1·77	29	1·44	3·33
Jimbour	1·54	47	1·04	1·85
Miles	1·64	50	1·86	2·50
Stanthorpe	2·04	62	2·14	3·44
Toowoomba	2·10	63	2·01	3·81
Warwick	1·85	70	1·60	3·44
Maranoa.				
Roma	1·47	61	1·92	1·63
State Farms, &c.				
Bungeworgorai	1·43	21	..	1·47
Gatton College	1·40	36	1·93	2·85
Kairi	1·11	21	..	0·97
Mackay Sugar Experiment Station	1·53	38	1·53	0·60

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1935.

Compiled from Telegraphic Reports.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Shade Temperature. Means. Min.	Shade Temperature. Extremes. Max.	Extremes. Date.	Extremes. Min.	Extremes. Date.	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·94	78	61	82	6	47	9	60	6
Herberton	..	71	49	81	30	39	30	7	2
Rockhampton	30·06	74	51	81	30	41	5	428	4
Brisbane	30·09	68	48	74	17	38	16	296	9
Darling Downs.									
Dalby	30·11	66	38	72	12, 20, 30	26	25	152	6
Stanthorpe	..	58	32	65	30	19	18	214	13
Toowoomba	..	61	40	69	30	28	5	201	5
Mid-Interior.									
Georgetown	29·98	80	55	87	31	45	28, 29	79	3
Longreach	30·06	71	44	81	16	36	24	137	3
Mitchell	30·11	64	38	75	29	25	25	205	6
Western.									
Burketown	30·00	79	56	87	20, 30	51	8, 9, 25	..	..
Boulia	30·06	71	47	87	29	38	25, 26, 27	..	..
Thargomindah	30·09	64	46	77	18	36	24	94	2

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	September, 1935.		October, 1935.		MOONRISE. Sept., 1935.	MOONRISE. Oct., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·9	5·35	5·34	5·51	7·23	7·3
2	6·8	5·35	5·32	5·52	7·53	7·44
3	6·7	5·36	5·31	5·53	8·27	8·32
4	6·6	5·36	5·30	5·54	9·5	9·26
5	6·5	5·37	5·29	5·55	9·45	10·22
6	6·4	5·37	5·27	5·56	10·35	11·23
						p.m.
7	6·3	5·38	5·26	5·56	11·32	12·28
					p.m.	
8	6·2	5·38	5·25	5·57	12·34	1·35
9	6·1	5·39	5·24	5·57	1·39	2·42
10	6·0	5·39	5·23	5·57	2·47	3·48
11	5·58	5·40	5·22	5·58	3·54	4·55
12	5·57	5·40	5·21	5·58	5·5	6·5
13	5·56	5·41	5·20	5·58	6·11	7·14
14	5·55	5·41	5·19	5·59	7·22	8·24
15	5·53	5·42	5·18	5·59	8·31	9·29
16	5·52	5·42	5·17	5·59	9·39	10·29
17	5·51	5·42	5·16	6·0	10·44	11·23
18	5·50	5·43	5·15	6·0	11·44	a.m.
19	5·49	5·43	5·14	6·1	a.m.	12·11
20	5·48	5·44	5·12	6·2	12·40	12·51
21	5·47	5·44	5·11	6·2	1·31	1·27
22	5·45	5·45	5·10	6·3	2·16	2·0
23	5·44	5·45	5·9	6·3	2·54	2·29
24	5·43	5·45	5·8	6·4	3·28	2·59
25	5·42	5·46	5·7	6·5	3·58	3·27
26	5·41	5·46	5·6	6·6	4·27	3·59
27	5·39	5·47	5·6	6·6	4·56	4·31
28	5·38	5·47	5·5	6·7	5·24	5·5
29	5·37	5·48	5·4	6·7	5·55	5·43
30	5·36	5·48	5·4	6·8	6·29	6·31
31			5·3	6·9		7·23

Phases of the Moon, Occultations, &c.

6 Sept.	☾	First Quarter	12 26 p.m.
13 ,,	○	Full Moon	6 18 a.m.
20 ,,	☽	Last Quarter	12 23 a.m.
28 ,,	●	New Moon	3 29 a.m.

Perigee, 13th September, at 4.6 a.m.
Apogee, 26th September, at 2.36 p.m.

On the 24th the Sun will arrive at what is technically called the First Point of Libra, exactly halfway around the sky from the First Point of Aries. These are the points where the ecliptic crosses the Celestial Equator and are really situated in the constellations Virgo and Pisces. On this occasion the Sun will cross the Celestial Equator southward and the length of the day increase from 12 hours (Equinox) to nearly 14 on the 24th of December.

Mercury sets at 6.50 p.m., 1 hour 25 minutes after the Sun on the 1st; on the 15th it sets at 7.36 p.m., 1 hour 54 minutes after it.

Venus sets at 6.31 p.m., 56 minutes after the Sun on the 1st; on the 15th it rises at 4.53 a.m., 1 hour before the Sun, and sets at 4.58 p.m., 44 minutes before it.

Mars rises at 9.39 a.m. and sets at 11.7 p.m. on the 1st; on the 15th it rises at 9.16 a.m. and sets at 10.55 p.m.

Jupiter rises at 9.39 a.m. and sets at 10.51 p.m. on the 1st; on the 15th it rises at 8.48 a.m. and sets at 9.7 p.m.

Saturn, apparently in Aquarius, rises at 5.26 p.m. and sets at 6.18 a.m. on the 1st; on the 15th it rises at 4.26 p.m. and sets at 5.19 a.m.

Mars and Jupiter, only a little more than 2 degrees apart on 28th August, will be 4½ degrees apart on 15th September, still in Libra.

The Cross will be at its highest point, due south at 2 p.m. on the 1st and at the lowest point 2 a.m.; it will therefore disappear at Warwick about midnight on the 1st; an hour earlier on the 15th and 2 hours earlier at the end of the month.

The Moon's path in September will be—In Virgo from 8 p.m. on the 1st to 4 p.m. on the 3rd; in Libra till 9 a.m. on the 5th; in Scorpio till 3 a.m. on the 6th; in Orphineus till 10 a.m. on the 7th; in Sagittarius till 1 a.m. on the 10th; in Capricornus till 6 p.m. on the 11th; in Aquarius till 9 a.m. on the 13th; in Pisces till 9 p.m. on the 15th; in Aries till 1 p.m. on the 17th; in Taurus till 10 p.m. on the 19th; in Gemini till 11 a.m. on the 22nd; in Cancer till 5 a.m. on the 24th; in Leo till 1 a.m. on the 27th; and again in Virgo till the end of the month.

5 Oct.	☾	First Quarter	11 40 p.m.
12 ,,	○	Full Moon	2 39 p.m.
19 ,,	☽	Last Quarter	3 36 p.m.
27 ,,	●	New Moon	8 15 p.m.

Perigee, 11th October, at 2.36 p.m.
Apogee, 23rd October, at 11.24 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Pioneers of the Sugar Industry—The Governor's Fine Tribute.

"IN paying tribute to the achievements of modern technological development, we should not be unmindful of the honour due to those courageous men who, in the face of great difficulties, laid the foundations of what has become the major agricultural industry of this State. I feel sure, therefore, that you all will agree that this important occasion—important, at any rate, to us here—should be commemorated by a cairn, dedicated to the memory of the pioneers of the Queensland sugar industry, and erected on the site where, in 1865, Captain the Hon. Louis Hope, built and operated the first sugar mill in Queensland."

The Governor of Queensland, Sir Leslie Orme Wilson, spoke thus when welcoming the delegates from twelve countries to the Fifth Triennial Congress of the International Society of Sugar Cane Technologists in the City Hall, Brisbane, on 27th August.

His Excellency, saying he considered it a great privilege to open the Congress, offered a warm welcome to all present, and particularly to the delegates from the twelve countries represented in the overseas delegation.

The occasion of the Fifth Congress of the International Society of Sugar Cane Technologists was unique inasmuch as he believed it to be the first International Conference held in Queensland, or in the British Empire, and their State was therefore especially honoured in being allotted this International Conference of Sugar Cane Technologists, added His Excellency.

Continuing, the Governor said:—

> The cane sugar industry is the only industry which is technically organised on an international basis. In this period of increasing national isolation, it is refreshing and reassuring to contemplate the existence of an organisation under the auspices of which there is a periodic international pooling and interchange of technical information, the results of research, and a frank discussion of technical problems in which racial, national, or geographic boundaries play no part.
>
> Among the delegates here assembled from twelve visiting countries are noted scientists, whose names will be for ever honoured in the annals of scientific cane sugar production. By researches in laboratory and field, they have played their part in advancing the technical status of the sugar industry to the proud position which it now holds. We, here in Queensland, deem it a great privilege to welcome such men, and are deeply sensible of the benefits which will be derived from their close personal contact with the problems confronting our young State.
>
> To all of us in Queensland, this meeting here in Brisbane of the Congress, is an event of very great importance and significance. Here, our distinguished visitors will find conditions in sugar producing which are unique and different from those of any other part of the world. I feel sure that they will appreciate the research work undertaken by the Colonial Sugar Refining Company and the Bureau of Sugar Experiment Stations.
>
> We have looked forward to this visit with the keenest anticipation—not only because we hope to increase our technical knowledge and unitedly may be guided to a forward step in technical advance in one of the greatest industries in the world, but because we hope to initiate—and in some cases to renew—friendships in other lands, and it has been so truly said that to desire the same things and to reject the same things constitutes true friendship.
>
> I trust that when we say a regretful farewell to you delegates when you leave our shores, it will be with a feeling, shared both by your and our selves, that we are friends in the very best interests—interests that we all are met in this Congress to promote.

The Romance of the Sugar Industry—The Premier's High Tribute to the Early Producers.

ON the occasion of the unveiling of a memorial cairn at Ormiston, near Brisbane, on 1st September, the Premier of Queensland, Hon. W. Forgan Smith, LL.D., paid a high tribute to the memory of the pioneers of the Queensland sugar industry. The large gathering present included members of the International Society of Sugar Cane Technologists from twelve sugar-producing countries besides Australia, and on the very site on which they were assembled began the manufacture of sugar in this State some seventy years ago.

It was indeed a high tribute, the Premier said, to the pioneers of the industry that so many of the leading sugar technologists of the world should gather together to pay honour to the memory of the late Louis Hope and others who had been associated with him in the cultivation and manufacture of the first sugar in Queensland.

In 1865, only six years after Queensland's separation from New South Wales, Louis Hope had erected the first sugar mill in Queensland at Ormiston, having cultivated 20 acres of sugar-cane a year or so before.

It was in response to an offer by the London Society of Arts of a medal for the first ton of sugar manufactured in Queensland that Louis Hope set up a mill, crushed his own sugar, and won the honour! As a result of his enterprise there were 2,000 acres of land under sugar-cane the next year, and three years later twenty-eight mills were operating in Queensland, manufacturing more than 2,000 tons of sugar. These were the first chapters in the romantic story of sugar in Queensland. In those early days the methods were necessarily crude. Both cane production and sugar manufacture were in their infancy, and the industry had not as yet the benefit of the knowledge and the research of the sugar technologists who had lifted the industry from primitive conditions of culture to high-grade efficiency. Queenslanders might well pay tribute to those pioneers—first for their enterprise and next for their courage, and last, but not least, for their achievement, the Premier said.

It was difficult for them to-day to appreciate the immensity of the task of the pioneers. Faced as they were with obstruction on every hand, they applied those well-known qualities of determination and endurance to a task and achieved success. It was very doubtful whether in recent years many Australian industries had improved their efficiency as much as had the Queensland sugar industry. That was something of which the men and women of the industry had reason to be proud.

In the year 1900, 10 tons of cane were required to manufacture one ton of sugar. In 1910, the tonnage was reduced to 8·73, and in 1920 to 8, in 1929 to 6·91. The brains of technologists had been available also in the increase of production of cane per acre. In 1900 an average of 11 tons per acre were crushed for a yield of 1·20 tons of sugar. In 1929 the

crushing was 16 tons per acre for a yield of 2·41 tons of sugar—double the former quantity. But efficiency had not been limited to production and to crushing. In the refinery section, Australian refineries were working with lower process losses than those elsewhere, and it was claimed that in the matter of fuel value and economy there was no greater efficiency in other countries than in Australia. Those results had come because of the efforts of the pioneer chemists and engineers, and were part of the technologists' contribution to the welfare and progress of the industry.

Queensland had a big stake in sugar. The sugar belt extended for over 1,200 miles from Mossman in North Queensland to the banks of the Tweed River, and every ton of sugar was produced entirely by their own labour. The sugar industry was a lesson to the world in organisation. Every stage of sugar production was efficiently organised. The interests of the grower, the worker, the miller, the refiner were aligned, and each was assured of sufficient remuneration to enable all to live according to the best Australian standards. Queensland was the only country in the world handling tropical production with such success.

Speaking of the technical advance of the industry, Mr. Forgan Smith said that in 1878 the sugar mills increased to 68. In 1885 the genesis of the central mill system led to the erection of the Racecourse and North Eton mills. In 1893 was passed the Sugar Workers' Guarantee Acts. In 1898 it was decided to establish a sugar experiment station at Mackay. In 1904 the Bureau of Central Sugar Mills was set up. In 1907 the Australian Sugar Producers' Association was launched. In 1913 the Excise and Bounty Act was repealed. In 1915 the first Sugar Cane Prices Act was passed. In 1920 the sugar agreement fixed the price to £30 6s. 8d. per ton. In 1929 the Queensland Society of Sugar Cane Technologists was inaugurated, and that day the Fifth Triennial Congress of the International Technologists was being held in Brisbane, concurrently with the dedication of the memorial cairn. The same foresight which had marked the general control of the sugar industry had gone to the setting up of that cairn, which was to be a memorial to all the sugar pioneers of Queensland.

The granite, of which it was constructed, had been taken from two of the important sugar-growing centres—Giru and Herbert River—and the building of the cairn was in itself interesting. The base was of unworked stone, typifying the pioneer days. Rising to the base of the shaft, they found the stone partially dressed, typifying progress, whilst the capping stone was machined, symbolising the present efficiency of the industry.

To-day they were being told to produce less. That was paradoxical in a world where there was a clamor for food for the hungry. He trusted that something of the same efficiency which had been the guiding star in the sugar industry would eventually find its way into the economic councils of the world, and that ultimately men and women would be

permitted to enjoy to the full the fruits of the soil, and to share in the bountifulness of nature and the full production of industry, such as the sugar industry. If they did that they would fulfil the great destiny which was theirs. They would be true to the heritage of those early pioneers who pointed to them the way to success.

Concluding, the Premier said he thanked the International Society of Sugar Cane Technologists for the invitation to unveil that memorial cairn. He desired to pay tribute to the organisation, which aimed at promoting production in both field and factory, and which so enthusiastically and efficiently had set about improving conditions in the sugar industry; and it gave him great pleasure to unveil that memorial cairn, and pay his humble tribute to the memory of those sugar pioneers who built so nobly and well.

Science in Agriculture.

THE value which science was playing in agriculture was emphasised by Hon. Frank W. Bulcock, Minister for Agriculture and Stock, while proposing a toast to the International Society of Sugar Cane Technologists, at a luncheon tendered to the society by the Premier and the State Cabinet. Mr. Bulcock acknowledged the debt of gratitude which Queensland owed to technologists of other countries, who had been prepared to impart their knowledge to scientific workers in the sugar industry of this State. Queensland was endeavouring to discharge that debt, he said, by making available data collated in this country, and the benefits of experience gained here. To-day, added Mr. Bulcock, the farmer recognised that the principle of science constituted a sheet anchor, which made all the difference between bankruptcy and prosperity, and if there was one society which stood out above all others in this direction it was the International Society of Sugar Cane Technologists.

In reply, the general chairman of the Society (Dr. A. J. Gibson, of Bingera, Bundaberg) said that the advance made on the technical side of the industry in Queensland had been phenomenal, and was largely due to the sympathetic attitude of the State Government and the executives engaged in the industry. As an ex-public servant over a period of about ten years, Dr. Gibson said he was well acquainted with the splendid co-operation that had always come from the Government and others, so far as sugar was concerned.

Pink Wax Scale.*

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

THE pink wax scale is abundant throughout the coastal districts of Queensland, and the blackening of the foliage of many trees both in orchards and bush, which is so commonly observed, is, for the most part, due indirectly to the presence of this insect. Though the pest (Plate 130) finds its greatest development in coastal regions, it is by no means confined to those parts, but may be found, sometimes in large colonies, more than 200 miles inland.

It attacks a very large number of plant species, including citrus, mango, fig, banana, guava, pomergranate, river cherries, pepperina, maiden-hair, and other species of ferns. It is, in fact, never surprising to find pink wax on any species of tree except perhaps those typical of very dry climates. It is, however, only as a pest of citrus that the insect becomes of real economic importance, and the control measures given below are designed specifically for use by citrus growers.

Description.

The young pink wax are more easily observed than is the case with most species of scale insects found on citrus. They are minute reddish-coloured creatures, which can frequently be seen running actively about amongst the old scales on the leaves and twigs. Soon after settling down and commencing to feed, these crawlers secrete a white covering. As development proceeds a band of red or pink wax appears below this white cap, and this band gradually increases in size. In a short time the white cap has increased in dimensions, particularly in height, and below this and all round is a red margin broken by eight white prominences, three on each side, and one at each end, forming a series of rays. By the time the adult stage is reached the scale is almost globular in shape and smooth except at the top where a small depression is found and towards the margins where there are two lobes on each side, the anterior one of which is well defined and prominent. Towards the base the wax may be produced to form a well-defined flange. The colour is deep pink except at the apex, where the white dot persists somewhat, and at the sides, where the narrow white bands mark the position of the openings of the breathing organs. In crowded colonies the outline may be considerably modified by the pressure of one scale against another.

The adult female insect is very soft-bodied and difficult to remove entire from the wax. It is hemispherical in shape, pink to reddish-brown in colour, and possesses very small legs. The female scale measures from one-eighth to one-sixth of an inch in length. The male scale has not been observed in this State.

Habits and Life History.

Pink wax is not native to Australia, but was probably introduced from Ceylon or some neighbouring part of Asia. As has been recorded, however, the insect attacks a large number of trees, and indigenous

* *Ceroplastes rubens* Mask.

Plate 130.

Pink Wax Scale, *Ceroplastes rubens* Maskell, showing infestation of leaves and twigs.

species, particularly river cherries, constitute a constant source of infestation, from which the pest spreads to orchard and other cultivated trees.

The female lays her eggs in a cavity beneath her body, and the young, on emerging, crawl around for several days before settling down to feed. During this crawling period they are comparatively easily dislodged from the twigs and foliage, and many are blown about by winds. It is by this means that the greatest distribution of the pest takes place, and as the young are thus brought in from outside sources to the orchard, it is impossible in most cases to establish any very lasting control.

Pink wax attacks the softest parts of the tree, and woody parts are never found to carry infestations; hence twigs and leaves carry practically the whole pink wax population on any tree. The scale is not itself very destructive, but it so weakens the attacked parts that the entry of fungi, such as melanose, and the incidence of other pests are greatly facilitated.

Though all varieties of citrus grown commercially in this State are attacked, the scale shows definite preferences in this regard. By far the most favoured variety is the Emperor of Canton mandarin, but other varieties of mandarins are also much favoured. Oranges as a rule harbour less of the pest than comparable mandarins, except in the case of Washington navels, which frequently carry very heavy infestations. Grapefruit and lemons seldom carry appreciable numbers of pink wax, and with these species it is very unusual to find the pest on trees more than four or five years old.

A colony of pink wax is almost invariably accompanied by a copious growth of sooty mould or fumagine. Though this sooty mould does not directly attack the tree, it is to some extent harmful, and when, as commonly happens, it covers the fruit, it is most objectionable.

There are two complete broods of pink wax each year, the first brood of the season appearing early in the summer. The breeding is, of course, largely dependent on climatic and other related conditions, and no definite time of appearance of the young can be stated. Generally, however, the first young make their appearance towards the end of November, and early in December large numbers of crawlers may be found. These complete their development in approximately three months, and towards the end of February, or, more typically, early in March, the second generation commences. Each female may take as long as a month to produce her progeny, and as there is sometimes a considerable difference in the times at which egglaying is commenced by the various females, the first hatched young may be of appreciable size and age before the last eggs are hatched. Fortunately this is not often the case, but when the times of emergences are widely separated, good control is most difficult.

Control.

The most essential point in the control of pink wax is to apply the scalicide at the correct time. As the young are commonly brought into the orchard by the wind from outside sources, it is essential to wait until this migration is as near completion as possible. For practical purposes it may be taken that when the typical young in the orchard are about the size of the head of an ordinary pin (Plate 131), it is time to apply the spray. On account of the heavy migration which is liable

to occur at the commencement of each generation, it is always better to be a little late with the application rather than early. In fact an early application which actually kills practically every young scale in the orchard, may be rendered valueless by the subsequent arrival of young from surrounding scrub and forest trees.

For general use the most satisfactory spray is one consisting of 24 cakes of Sunlight soap, 12-14 lb. of clean fresh washing soda, and 75 gallons of water. Other soap may be used, but in experimental work the best results were obtained with Sunlight. It may be necessary to heat some of the water to dissolve all the soap.

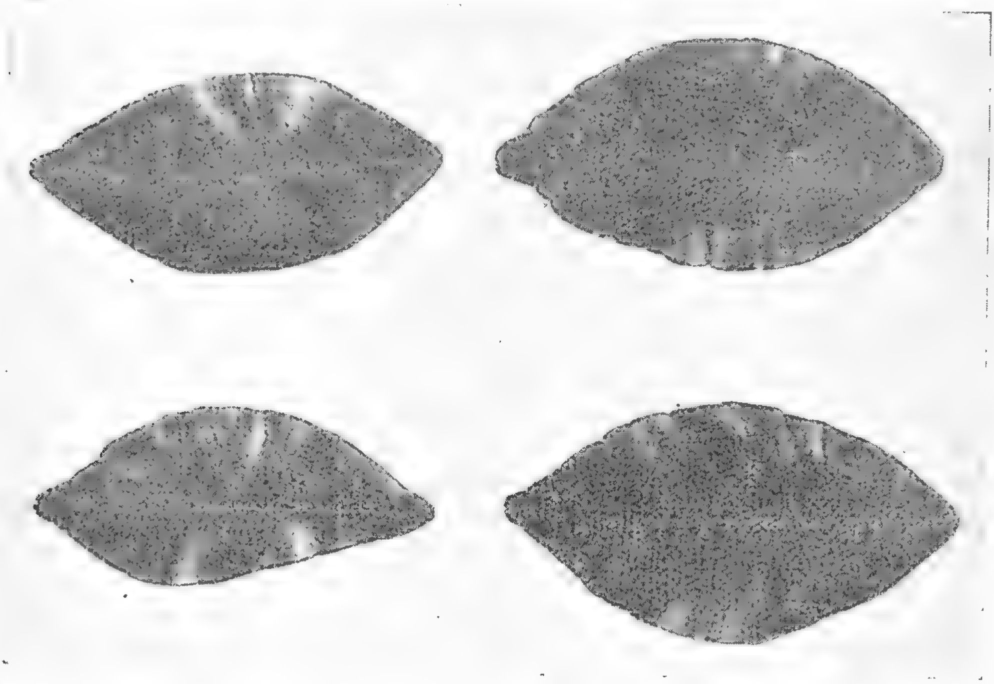


Plate 131.

Pink Wax Scale, *Ceroplastes rubens* Maskell, showing young in correct stage for spraying.

A washing soda wash containing 1½ lb. of clean fresh washing soda to each four gallons of water may be used. This scalicide is effective but rather drastic on the trees in certain circumstances, particularly during hot weather.

A resin—caustic soda—fish oil mixture may also be used effectively against pink wax. It is particularly useful at those times when the emergence of the brood is rather protracted, as it is effective against much older individuals than either of the two first-mentioned sprays. The formula of the mixture is 10 lb. resin, 3 lb. caustic soda of good commercial quality, 1½ lb. fish oil, preferably herring oil, and 40 gallons of water. Details of the manner of preparation of this mixture are available in other departmental entomological publications.

Fumigation with hydrocyanic acid gas is also effective against pink wax, though the kill of this species is rather less than that obtained in most other species of scale insects found on citrus in this State.

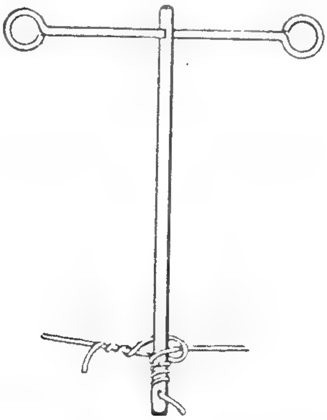
The control of pink wax is by no means easily accomplished, and commercial growers with large numbers of trees affected by the pest are advised to consult Bulletin No. 10 of the Division of Entomology and Plant Pathology in which fuller information on the subject is to be found.

Removal of Sooty Mould.

It must always be remembered that sooty mould cannot exist without the presence of pink wax or some such insect which will provide it with food material. Therefore the best method of coping with the sooty mould is to combat the insect pest. There are, however, times when this is impracticable, and then it generally becomes necessary to remove the mould from the fruit before marketing. Light brushing may be employed, and with light infestations this is usually all that is required; washing the fruit may, however, have to be adopted. Recently Mr. J. L. Smith, of Palmwoods, brought to notice a method, the details of which were published in "Farming in South Africa." This consists in immersing the fruit for approximately one minute in a solution containing ¼ lb. of boracic acid and ¼ lb. of chloride of lime to each gallon of water. This method has been employed largely in the Maroochy district during the present season, and has been found very satisfactory. The mould was thoroughly removed from the fruit, and tests showed that no ill effects to the fruit followed the application of this treatment. It is recommended that the fruit be well washed after immersion in the cleansing solution, as otherwise a whitish deposit will probably be left on drying. It is, of course, very advisable to allow the fruit to dry well before packing.

A WIRE SPLICER.

The illustration shows a wire stretcher and splicer, which has been used with success. Take a piece of ¾-inch rod 18 inches long, and drill a ¼-inch hole 1 inch from one end to receive the wire to be stretched. Flatten the other end and drill



a $\frac{7}{16}$-inch hole to receive a ⅜-inch by 18-inch rod for a handle. Put it through and turn the loops on each end. The illustration shows how to use when repairing a broken wire. It can also be used as an ordinary stretcher.—"The New Zealand Farmer."

Our Present Knowledge of the Association of Insects with Disease.

By F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

ALTHOUGH the part played by insects in the spread of disease is of comparatively modern determination, the suggestion that insects and disease may be intimately associated is centuries old. As early as 1577, Mercurialis, an Italian physician, suggested that plague, which was then ravishing Europe, may be carried by flies feeding on the dead and dying and later depositing contaminated fæcal matter on the food consumed by healthy persons. In the literature of the 18th century, various theories appeared as to the association of insects with disease. Edward Bancroft, in 1796, contended that yaws was transmitted by flies, which fed on diseased persons and spread the infection by settling on open wounds and abrasions on healthy persons. In 1848, Josiah Nott, of Alabama, published a remarkable article in which he gave reasons for supposing that yellow fever was an insect-borne disease, and although he mentioned many insects he did not specify any one as the particular vector. The connection between the mosquito and malaria had long been held, it is said, by the Italian and Tyrolese peasants, and even by the natives of East Africa, but the first charge to be brought against the mosquito by scientific authority was in connection with yellow fever, when in 1881 the transmission of this disease was attributed to a definite species. Three years later the first well-formulated theory of the mosquito and malaria was advanced, and in 1898, Ross, in India, demonstrated beyond doubt the important role played by mosquitoes in the dissemination of this disease. In 1894, Smith and Kilborne showed that the redwater organism in cattle, *Babesia bigeminum,* was carried by the tick *Boophilus annulatus,* and epoch making in the history of the association of insects with those diseases brought about by infestation with helminths or worms was Manson's discovery that mosquitoes were the vectors of *Waucheria bancrofti,* which causes filariasis in man.

During and immediately subsequent to the period of the Great War, lice were discovered to be the vectors of trench fever, and the role of the house fly in the dissemination of disease organisms was proven beyond doubt. These discoveries provided the necessary recognition of the importance of insects in the spread of disease, and during the past twenty-five years the evidence brought to light has been so outstanding that entomology must now take its place as an invaluable branch of preventive medicine.

Only what are considered the more important insect-borne diseases are dealt with in these notes. It is proposed to divide the discussion into six sections according as the diseases are directly attributable to insects; or are of unknown origin; or of virus origin; or of bacterial origin; or of protozoan origin; or, finally, of helminthal origin. The term insect has been used in its broad sense to include the mites and ticks, for the omission of these on the grounds that they are not true insects, would, it is considered, seriously impair any value which may otherwise be attached to these notes.

How Insects Carry Disease.

The part played by insects in the transmission of disease may be either mechanical or biological. Mechanical transmission concerns those organisms which are taken up by the insect when feeding on excretionary substances and later deposited on food. The organism may pass through the insect's body to be later excreted in the fæces, or simpler still, may be transported per medium of the hairs, etc., of the insect's legs and body to which it adheres.

Biological transmission on the other hand occurs when the organism must pass part of its life cycle in the insect before it reaches the stage in which it is ready to infect the host. In this case the insect is known as the intermediate or secondary host.

When insects carry disease germs to food and water the method of transmission is called contamination. This is the simplest form of transmission and occurs also, of course, when the disease organism gains access into the body through the presence of wounds.

There are also diseases which have their origin through the insect carrier biting the body and sucking blood. Such a disease is transmitted by inoculation.

Insect-borne Diseases of Unknown Origin.

Of the insect-borne diseases of unknown origin probably the most important is dengue fever of man. This is typically a disease of Australia, though it has been reported from India, Africa, and other places. The insect concerned in its transmission is the day-biting house mosquito, *Aedes aegypti.*

Paralysis of man and the domesticated animals through infestation with ticks is known from Australia, South Africa, and North America, the species concerned being *Ixodes holocyclus, Ixodes pilosus,* and *Dermacentor andersoni,* respectively. This paralysis is considered to be due to the injection of a toxin which is secreted in the salivary glands of the female tick at the period when it is approaching engorgement.

Insect-borne Diseases of Virus Origin.

Yellow fever of man, which occurs in South and Central America and West Africa, is mosquito-borne, and is transmitted by *Aedes aegypti.* It is a remarkable fact that the mechanism of transmission of yellow fever by this species of mosquito was discovered long before the cause of the disease, and the knowledge thus gained has been so successfully applied that the disease has to a large extent been eradicated. It was the application of this knowledge that made the Panama Canal a possibility. Louping ill, a serious disease of sheep, and sometimes man, is transmitted in England by the tick *Ixodes ricinus,* and in South Africa (Kenya) by the species *Rhipicephalus appendiculatus.* Rift Valley fever of sheep, cattle, and man has recently been demonstrated to be spread by three species of mosquitoes of the genus Mansonia. Nairobi sheep disease is carried by the ticks *Rhipicephalus appendiculatus* and *Amblyomma variegatum.* Fowl pox, a cosmopolitan disease of fowls which is contagious, may also be carried by mosquitoes, whilst a species of this family, *Aedes lineatopennis,* may transmit the African disease of sheep known as blue tongue.

Insect-borne Diseases of Protozoan Origin.

The most important vectors of diseases of this type are the biting insects, the disease being usually transmitted through the act of sucking blood.

Of the many diseases of protozoan origin affecting man one of the most important and most widespread is malaria, the plasmodium of which is carried by various species of anopheline mosquitoes. Avian malaria is also mosquito-borne, *Culex fatigans, Cilex pipiens,* and two species of Aedes being concerned in its transmission.

To this group of diseases belong the various forms of diseases carried by the African tsetse flies. Human sleeping sickness caused by *Trypanosoma gambiense* is transmitted by the fly *Glossina palpalis,* while nagana of domestic animals caused by *T. vivax, T. brucei,* and *T. congolense,* may be transmitted by the same species. *Glossina morsitans* is also a carrier of the nagana trypanosomes, and also transmits *T. rhodiense,* which causes Rhodesian sleeping sickness. *Glossina pallidipes* may also transmit nagana. Soumaya, a disease of horses in the French Soudan, and also a trypanosome disease (*T. cazalboui*) is carried by tsetses. Surra (*T. evansi*), a serious disease of cattle and horses, may possibly be spread by any species of biting fly, but Tabanidae are the principal vectors. In South America the Trypanosome causing Chaga's disease of man, *T. cruzi,* is transmitted by species of the bug Triatoma.

Several diseases associated with Rickettsias are also carried by biting insects. Sandfly fever, or Mediterranean fever, is transmitted by the sand fly, *Phlebotomus papatasii.* The body louse, *Pediculus humanus corporis,* is the insect concerned with epidemics of trench and typhus fevers. Japanese river fever, endemic typhus, and Sumatran paratyphus are all transmitted by mites, the species concerned being *Trombicula akamuski, Liponyssus bacoti,* and *Trombicula deliensis,* respectively.

Three species of ticks, *Dermacentor andersoni, D. variabilis,* and *Haemaphysalis leporis-palustris* are responsible for the transmission of Rocky Mountain spotted fever, a disease of man occurring in the Rocky Mountain districts of the United States. African heartwater of cattle, sheep, and goats is also tick-borne, *Amblyomma hebraeum* and *A. variegatum* acting as transmitters.

Of the human spirochaete diseases, relapsing fever, caused by *Treponema recurrentis,* may be transmitted by either the head louse or the body louse. The tick *Argas moubata* transmits the African type of this disease caused by *T. duttoni.* The bed bug may also be concerned in the transmission of relapsing fevers, as these have been successfully transmitted by crushing bugs on the skin near the bite. Fowl tick fever, *Treponema gallinarum,* is carried by the fowl tick, *Argas persicus.* Spirochaetosis of cattle and horses in South Africa is spread by *Boophilus decoloratus,* a tick very closely allied to our own cattle tick.

Red-water disease, or piroplasmosis of cattle, which is receiving considerable attention in Australia at the present time, is caused by an organism known as *Babesia bigeminum.* In Australia the only known carrier is the tick *Boophilus microplus,* which also transmits the disease in the United States, South America, and South Africa. In this latter country the ticks *B Boophilus decoloratus, Rhipicephalus appendiculatus, R. evertsi,* and *Haemaphysalis cinnabarina punctata* are

also known carriers. In the United States the principal intermediate host of this disease is *B. annulatus.* The English form of bovine tick fever, caused by *Babesia bovis,* is transmitted by *Ixodes ricinus.* An allied organism is found in dogs causing canine piroplasmosis, or malignant jaundice, and is transmitted by the ticks *Rhipicephalus sanguineus, Haemphysalis leachi,* and *Dermacentor reticulatus.* Ovine piroplasmosis is carried by *Rhipicephalus evertsi,* while the poultry piroplasm, *Aegyptianella pullorum,* is carried by the fowl tick *Argas persicus.* African gall sickness, or anaplasmosis of cattle, which occurs also in America and Australia, is said to be transmitted by various species of ticks, namely *Boophilus decoloratus, Rhipicephalus simus, R. sanguineus, Dermacentor variabilis,* and *Boophilus annulatus,* whilst American workers claim successful transmission of the organism of this disease with various species of Tabanidae and the stable fly, *Stomoxys calcitrans.* In Africa, east coast fever of cattle, caused by *Theileria parva,* is spread by no less than five ticks of the genus Rhipicephalus, of which *R. appendiculatus* is the most important, whilst biliary fever of horses (*Nuttallia equi*) is transmitted by two species of the same genus.

Sand flies of the genus Simulium, *S. venustum,* transmit Leucocytozoon of ducks, and while *Leishmania donovani,* the flagellate cause of Kala Azar, is able to undergo development in *Phlebotomus argentipes* and *P. chinensis,* no transmission experiments with man have yet been successful. Oriental sore, caused by *Leishmania tropica,* however, is probably transmitted by *P. papatasii.*

Among the non-biting flies the house fly, *Musca domestica,* is implicated as a vector of *Treponema pertenue,* which causes yaws, and the same species may act as a mechanical transmitter of the cystic forms of various protozoa which give rise to pathogenic conditions in man, such as amoebic dysentery.

The house fly and species of blowflies, Chrysomia and Sarcophaga, are also associated with the spread of murrina, a trypanosome disease of horses present in the United States and Central America.

Insect-borne Diseases of Bacterial Origin.

A brief survey of the data relating to the Muscid flies, particularly the house fly, *Musca domestica,* reveals that these flies are capable of transmitting a large number of diseases caused by bacterial infection. Some of the organisms are taken from sputum, some from infected wounds, and some from excreta. We find, for example, the organisms of conjunctivitis, infantile diarrhoea, enteritis, typhoid fever, food poisoning, tuberculosis, anthrax, erysipelas, bacillary dysentery, and cholera normally carried by flies which frequent our houses, visit our bodies, and pollute our food. There is also evidence that these flies may carry the organisms of other diseases, and it would seem as though such flies can carry any bacterial disease in which the organism is available to the insects in the sputum, on the body, or in the excreta.

Cockroaches may also play a part in the spread of bacterial diseases, for the germs of septicaemia have been shown to be carried on the feet of *Blatella germanica,* whilst *Blatta orientalis* has been demonstrated experimentally to transmit anthrax.

Biting flies are responsible for perhaps only one serious disease of bacterial origin, namely, anthrax, which may be transmitted by some species of Tabanidae and the stable fly, *Stomoxys calcitrans.*

Fleas are extremely important as being concerned with the transmission of *Bacillus pestis,* the cause of bubonic plague. *Ctenocephalides canis, C. felis, Leptopsylla segnis,* and *Pulex irritans* have been shown capable of transmitting this disease from rat to rat, but the only species yet implicated in its transmission to man are *Xenopsylla cheopsis, X. astia,* and perhaps *X. braziliensis,* of which *X. cheopsis* is the most adapted carrier. The organism is taken up with the blood of the host, and infection occurs through the scratching in of the flea fæces or of the regurgitated bacillus-laden blood. Fleas may also play some part in the transmission of other diseases the organisms of which occur in the blood, for it has recently been discovered that the cat flea, *Ctenocephalides felis,* may transmit *Pasturella boviseptica,* a cause of haemorrhagic septicaemia in cattle.

Tularaemia, a disease of wild rodents in North America, and transmissible to man in whom it takes the form of a slow fever accompanied by considerable emaciation, may be spread by a number of biting insects and ticks, and of the latter the following species have been proved carriers:—*Haemaphysalis leporis-palustris, Dermacentor variabilis, D. andersoni, Rhipicephalus sanguineus,* and *Amblyomma americanum.* Ticks may possibly be concerned in the mechanical transmission of many bacterial diseases, for their bite is usually severe, and constitutes a ready access for many bacteria into the body.

Insect-borne Diseases of Helminthal Origin.

The part that insects usually play in the propagation of the worm parasites of the higher animals is that of intermediate hosts in which certain larval stages of the parasites are passed before they are ready to enter their final hosts in which they develop to maturity. The eggs of certain roundworms and tapeworms may also be mechanically carried by certain excreta feeding insects such as flies and cockroaches, but the importance of insects as transmitters in this role is generally conceded to be comparatively slight.

Insects may become infected and act as intermediate hosts in various ways. The eggs of worms which inhabit the alimentary canal are discharged with the fæces, and here the coprophagous insects, if they are suitable, play their part. Certain parasites which in the adult stage live in relation with the blood stream have blood-sucking insects as intermediate hosts. The final host becomes infected when in some way or other it ingests the insect containing the larval stages or the larval stages gain ingress into its body through the insect sucking blood.

The order Diptera is one of the most important in the role of transmitters of helminth diseases of man and domestic animals. *Waucheria bancrofti,* the cause of filariasis in man, a disease widely spread throughout the world in tropical and subtropical regions, is transmitted by various anophelene and culicine mosquitoes, chief of which is the night-biting house mosquito, *Culex fatigans.* Loa loa, a somewhat similar disease is spread by species of flies belonging to the genus Chrysops. Sand flies play an important role as transmitters of allied worms, for *Simulium damnosum* transmits *Onchocerca volvulus, Culicoides austeni* transmits *Acanthocheilonema perstans,* and *C. furens* transmits *Filaria ozzardi,* all of which are parasites of man. The intermediate host of *Onchocerca cervicalis,* which is found in the neck ligament of the horse, and considered to be associated with poll evil, is also a sand fly,

Culicoides nebulosus. The heart worm of dogs,, *Dirofilaria immitis,* is spread through the agency of certain mosquitoes, Anopheles, Myzorrhynchus, *Culex fatigans* and *Aedes aegypti.* Habronemiasis of the horse, a disease associated with infestation by species of Habronema and a cause of debility in these animals, is spread by the house fly (*H. megastoma* and *H. muscae*) and the stable fly, *Stomoxys calcitrans* (*H. microstoma*) both of which intermediate hosts become infected in the larval stage through feeding in dung containing the eggs of these parasites. The house fly is also an intermediate host for certain species of tapeworms infesting poultry.

Certain species of fleas act as intermediate hosts for tapeworms also. *Ctenocephalides felis, C. canis,* and *Pulex irritans* have proved suitable for the development of the larval stage of *Dipylidium caninum,* a common tapeworm of the dog which is occasionally found in children. *Hymenolepis diminuta,* a tapeworm of rats and of frequent occurrence in man, has been recorded in the larval stage from *Ceratophyllus fasciatus, Xenopsylla cheopsis, Pulex irritans,* and *Ctenocephalides canis.*

Cockroaches are also concerned, for *Oxyspirura parvovum,* the eye worm of the domestic fowl, is spread by *Pycnoscelus surinamensis;* and *Blatella germanica* is the intermediate host of *Gongylonema pulchrum* of cattle and sheep. The tapeworm *Hymenolepis diminuta* may also be transmitted through the agency of species of this family.

There is a single record of a species acting as the intermediate host of an helminth parasite in each of the orders Anopleura or lice, Lepidoptera or butterflies and moths, and Isoptera or white ants, where we find the common biting louse of the dog, *Trichodectes canis,* an intermediate host of the tapeworm *Dypilidium caninum* of the dog; the lepidopteron *Asopia farinalis,* an intermediate host of *Hymenolepis diminuta* of the rat and man, and *Macrohodothermes mossambicus,* a termite concerned in the transmission of *Harteria gallinarum,* a nematode parasite of the fowl, respectively.

Grasshoppers belonging to the genus *Melanoplus* have been found suitable for the development of the intermediate stages of species of *Tetrameres* and *Acuaria hamulosa,* which occur in the glandular stomach and gizzard, respectively, of the domestic fowl. In this host, also, a fluke found in the oviducts, *Prosthogonimus* spp., is spread by various species of dragon flies.

It is not surprising that the order Coleoptera or beetles should contain numerous species acting as intermediate hosts for worm parasites, as this order includes a large number of dung-frequenting species. Many of the tapeworms of poultry and certain of the nematodes of the higher animals are spread in this manner. Two species of stomach worms of the pig are dependent upon species of Geotrupes and Scarabæus for their larval development, whilst larvæ of beetles of the genera Melalontha, Cetonia, Phyllophaga, and Diloboderus are required to complete the life cycle of the thorn-headed worm of pigs.

Diseases Directly Attributable to Insects.

All pathological conditions directly attributable to insects, whether of a serious nature or not, should be included in a complete survey. The fear of insects, the annoyance and worry they cause, are types of such conditions due to insect presence, and numerous instances may

be quoted of the injuries which may follow attempts to avoid the attacks of insects. The irritation and other ill effects caused by biting flies, such as sandflies and march flies, and by the myriads of bush flies which frequent the secretions of the mouth, eyes, and nostrils are generally recognised. Outstanding of all types of injuries directly due to insects is myiasis—i.e., the attack of living animals by fly larvae. Of the first form of myiasis we have an excellent example in the sheep maggot flies. Here we have a number of species of flies whose maggots are to be found infesting the living sheep and causing untold agony and loss. Fortunately, so far as we in Australia are concerned, this is the only example of myiasis we are likely to encounter at all frequently. In Europe, America, and Africa there are certain species of flesh flies and blowflies of the genera *Sacrophaga, Wohlfartia, Cochliomyia,* and *Chrysomyia,* whose larvae infest open wounds and abrasions in many animals, including man. Another type of myiasis is furnished by the warble flies, *Hypoderma* sp., which occur during part of their lives beneath the skin of cattle. In South America a very interesting type of subcutaneous myiasis occurs. The oestrid concerned is *Dermatobia hominis,* normally a parasite of cattle which has turned its attention to man. The eggs of this fly are deposited on the bodies of certain blood-sucking flies, especially the mosquito *Psorophora lutzi,* or attached to leaves frequented by these insects, whence they adhere to them. As soon as the insect bites, the heat of the animal or of the ingested blood causes the larvae to hatch and penetrate the skin.

The tumbu fly of Africa, *Cordylobia anthropophaga,* causes a similar type of injury to man and many domesticated and wild animals.

The outstanding species in intestinal myiasis are the bot flies of the genus *Gastrophilus,* whose larvae are to be found in the stomach of the horse and mule. Cases of intestinal and urinogenital myiasis, due to the larvae of *Fannia canicularis,* the latrine fly, *Piophila casei,* the cheese skipper, *Eristalis tenax,* the bee fly, and a few others, are fairly frequent, and worthy of inclusion as being of interest. Certain beetles of the genus *Onthophagus* have been recorded as infesting the intestinal tract of man and the domestic animals, and may at times have a harmful effect.

Of the blood-sucking forms of fly larvae the most important is the Congo floor maggot, *Auchmeromyia luteola,* which is closely associated with man. The larvae are nocturnal feeders, coming out at night and engorging with blood.

Finally we have the type of myiasis represented by the forms infesting the head passages, of which the sheep bot, *Oestrus ovis,* is the most typical. Other species of Oestridae are to be found in the nasal passages of deer, camels, &c.

The blood-sucking flies, of which the sand flies, march flies, mosquitos, stable fly, louse flies, buffalo, and horn flies are typical examples, and various species of ticks may, if very numerous, cause quite an appreciable loss of blood. Their bite is in some cases particularly severe, and it may also be the cause of a secondary and severe pathogenic disease.

The presence of lice is exceedingly annoying, and leads to a great deal of itching and scratching. Several skin diseases, such as urticaria, melanodermia, eczema, and pyodermia, may be a direct result of their

presence. Lice attack also, especially among the domesticated animals, may be so severe as to keep the animals poor and unthrifty, and may, in the case of young animals, result in death.

In the case of mite presence, various types of mange and scab result. The attack of the chigger mites of Europe and America is painful and difficult to relieve. Many of us are familiar with "scrub itch," which is caused by allied Trombidiid mites, and frequently our persons are subjected to an intense general and prolonged itching through the attacks of poultry mites which are carried into our houses by sparrows, pigeons, and starlings.

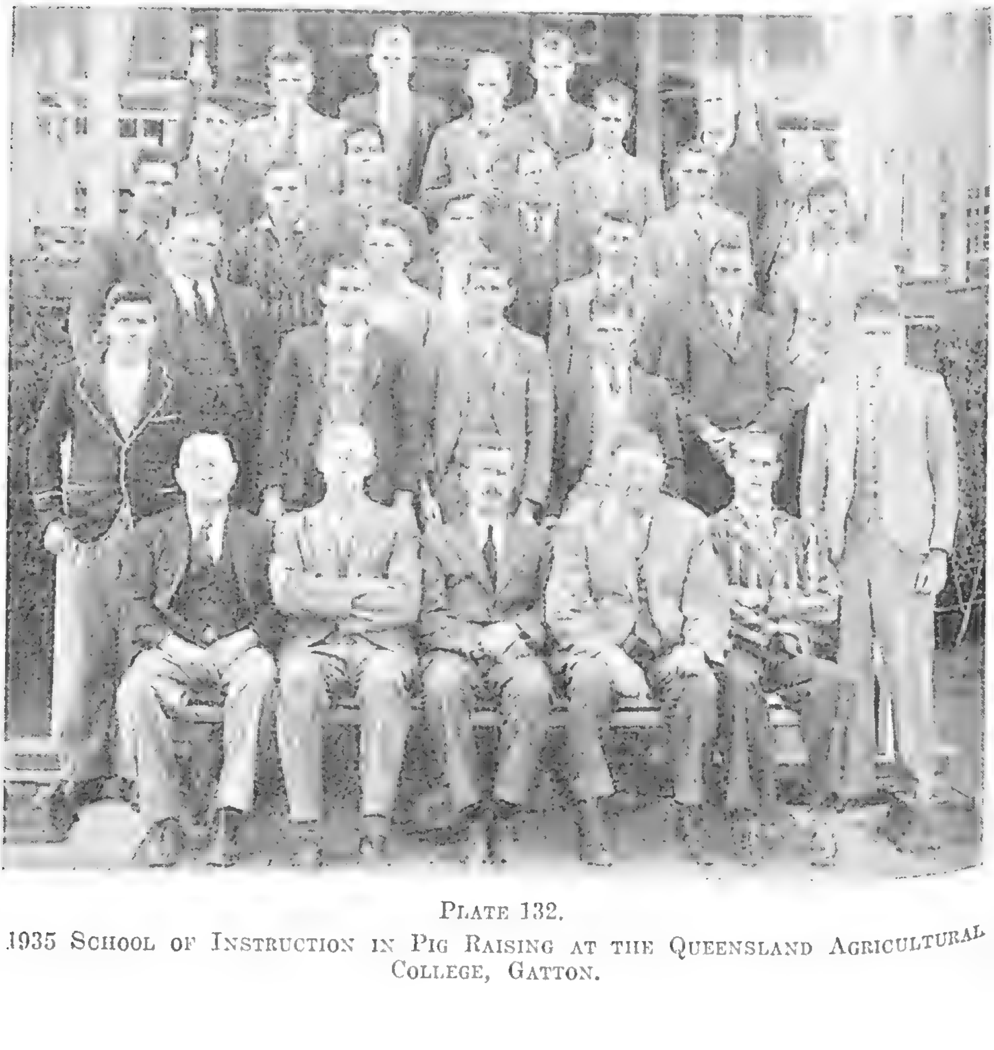


Plate 132.

1935 School of Instruction in Pig Raising at the Queensland Agricultural College, Gatton.

Sickness among Horses.

By J. A. RUDD, Director, Animal Health Station, Yeerongpilly.

RECENTLY cases of sickness among horses have been reported on the Western Darling Downs, beginning at Dulacca, and through Roma, Yeulba, and more recently at Mungallala, on the North Coastal region, in as far as Kilcoy. For years isolated cases of this trouble, which assumed the form of an epidemic, have been around Warwick and surrounding district.

The symptoms come on suddenly, and are usually noticed in the morning. They consist of the horse looking excessively dejected, as if he had been poisoned by some weed or mineral substance. He refuses food, and is in manifest pain, which comes on in spasms. His temperature is about 105 deg. F., respiration and pulse accelerated, with profuse diarrhoea and an insatiable thirst is gradually developed and lasts until the animal is prostated with sheer weakness, and death quickly follows.

Post mortem examination has proved that there is a marked relaxation of the pyloric phincter and a fluid condition of all contents of the alimentary tract, and, in some cases, marked enteritis in the peritoneal cavity, with a certain amount of pneumonia and congestion of the lungs in the pleural cavity. This latter condition depends largely on the ability of the animal to stand up to the attack for any length of time. The more emaciated or aged animal succumbs much sooner than those which are younger and stronger.

Treatment consists of bringing the animal into a warm, well-ventilated stable and rugging him, then the following ball or mixture should be administered:—

Aromatic spirits of ammonia	3 oz.
Tincture of opium	3 oz.
Raw linseed oil	7-8 oz.

This drench should be administered at once. Generally one drench is sufficient to bring about a marked improvement in the condition, provided it is administered as soon as the symptoms are first noticed.

A second drench may be given in about three hours. Water should be withheld for at least twenty-four hours, but a little straw or hay could be allowed if necessary as bulk. By far the better treatment is the following:—

Carbonate of ammonia	2 drachms
Powdered nux vomica	2 drachms

To be placed in a four-drachms gelatine capsule and administered as a ball.

The danger of this treatment must be apparent to all those who cannot efficiently administer a physic ball to a horse. If this ball breaks, the mouth is scalded, and water should be allowed so that the horse's mouth should be washed out. Usually two balls administered four hours apart are sufficient to effect a cure.

Animals which have not been under treatment, but have been on stable feed, have been known to recover, but only at the expense of a severe attack of laminitis or founder of the feet.

Horses affected out at grass, under paddock conditions, have also been known to make a good recovery without treatment, and an equal percentage, under similar conditions, have also died of the disease.

This ailment has been met with during the last ten years on the Darling Downs, but has never been reported in any other district in Queensland previous to this season.

TETANUS (LOCK JAW) AND ITS DANGERS.

Thus the medical correspondent of the "Sydney Morning Herald":—

Tetanus is a dangerous disease, and the mere mention of it has always caused fear because of its insidious method of attack and the high death-rate associated with it. It has attracted considerable attention of late years on account of the suggestion of the risk of its occurrence following surgical operations.

Tetanus, which is sometimes called "lockjaw," is caused by a germ which inhabits the soil and the intestinal canal of many kinds of animals. It has the capacity to form spores, which are very difficult to kill, and this is the great reason for the difficulty of guarding against infection. Bacteria or germs are easily killed by simple boiling, and in most cases by drying or the action of sunlight, and disease germs usually have a very brief capacity for life outside the body. Spores, on the other hand, can resist boiling for a considerable time. Fortunately, very few disease germs have the capacity for spore formation, but the tetanus bacillus is one of these.

In some countries, the soils are impregnated with tetanus germs. This is the case in many parts of America, and hundreds die every year from trivial scratches. The soil of France and Belgium in the war zone was crowded with tetanus germs, and the disease would, in all probability, have stopped the war by virtue of the almost inevitably fatal termination to all wounds, had it not been for the universal use of anti-tetanic serum. Fortunately the disease is relatively rare in Australia.

There is a popular belief that a wound at the base of the thumb is especially dangerous. There is no basis for this beyond the fact that any wound on the hand is more likely to be infected with tetanus germs which exist in soil than are wounds elsewhere.

The germ of tetanus belongs to a variety of germs that are known as anaerobic, because they flourish in the absence of air better than when exposed to the air, Consequently, deep punctured wounds, where air cannot reach the depths, are more dangerous than shallow cuts or grazes. If tetanus germs are present on the skin a mere puncture with a pin can prove fatal.

In countries where tetanus is common, every wound, however trivial, should be treated by an injection of anti-tetanic serum, but this is quite unnecessary in this country. However, it is wise to give an injection even in Australia in the case of wounds where there is contamination with soil or stable manure, especially if the wound is of the punctured variety. It should certainly be given in serious street accidents, and in cases where a garden fork or spade has injured a foot.

Tetanus may not develop for weeks after the original injury, but as a rule the earlier the onset of symptoms the more severe the attack. The important point to remember is that while the disease is very difficult to cure, it is very easily prevented. The war proved that anti-tetanic serum is sufficient to protect in over 99 per cent. of cases, but the same serum is not very effective in the treatment of an established case after symptoms have commenced.

There has been considerable public fear of the possibility of post-operative tetanus. It is true that there have occurred several cases in the past two years. It is also true that the tetanus germ is a normal inhabitant of the intestines of the sheep, from which surgical catgut is made. But, on the other hand, there have been as many cases of post-operative tetanus following operations in which catgut has not been used at all. In these cases it is certain that the germ was either present in the patient before operation, or was blown into the wound from minute dust particles in the air.

BLOWFLY STRIKE IN SHEEP.

METHODS OF CONTROL.

By JAS. CAREW.

THE serious problem, although claiming the attention of practical men and scientists for years, is still causing considerable trouble and loss. Shearing the sheep gives a high percentage of protection during normal conditions for several weeks. As approximately 90 per cent. of strike takes place around the crutch, the method of crutching is practised to act as shearing does, that is to reduce the length of wool to allow the surface to dry out, and reduce the length of protective covering. Dipping, say, about six weeks after shearing, especially with those mixtures which carry 2 per cent. of arsenic, is another protective measure which is not fully appreciated.

As a result of experiments carried out over a period of several years, both at Gindie State Farm, Emerald, and Dalmally, near Roma, jetting an arsenical mixture containing ·7 per cent. of arsenic per 100 gallons of water through a jetting nozzle into the wool of the crutch, at from 60 to 160 lb. pressure per square inch, was found to give most satisfactory results.

Since then, arsenic has been included in practically all the most reliable dressings for protecting the sheep against strike. Other recommendations to render the sheep less susceptible to strike, are important, and include breeding to eliminate wrinkles and crutch folds. The removal of crutch folds as introduced by M. J. H. Mules, called "The Mules Treatment," which is a surgical but simple operation. By these methods, it is not claimed that they will prevent strike, but to minimise it to an appreciable extent. Usually flies become active about three weeks after the first spring rains, and if conditions are favourable, they come in waves, increasing in intensity until difficult to control with any of the methods yet introduced. Many blowfly specifics are now manufactured in Queensland, all of which carry instructions on the

labels. This Department published a formula about two years ago as follows:—

40 per cent. Shell Diselene Oil or Vacuum 28-38 Fuel Oil;
55 per cent. Herring or Cod Oil;
5 per cent. Cresylic Acid;
0·1 Sodium Arsenite, or 1 lb. to 100 gallons.

For the convenience of making 5 gallons of the mixture, take 22 pints cod oil, 16 pints fuel oil (not more than 875 specific gravity), 2 pints cresylic acid, and 1 oz. sodium arsenite.

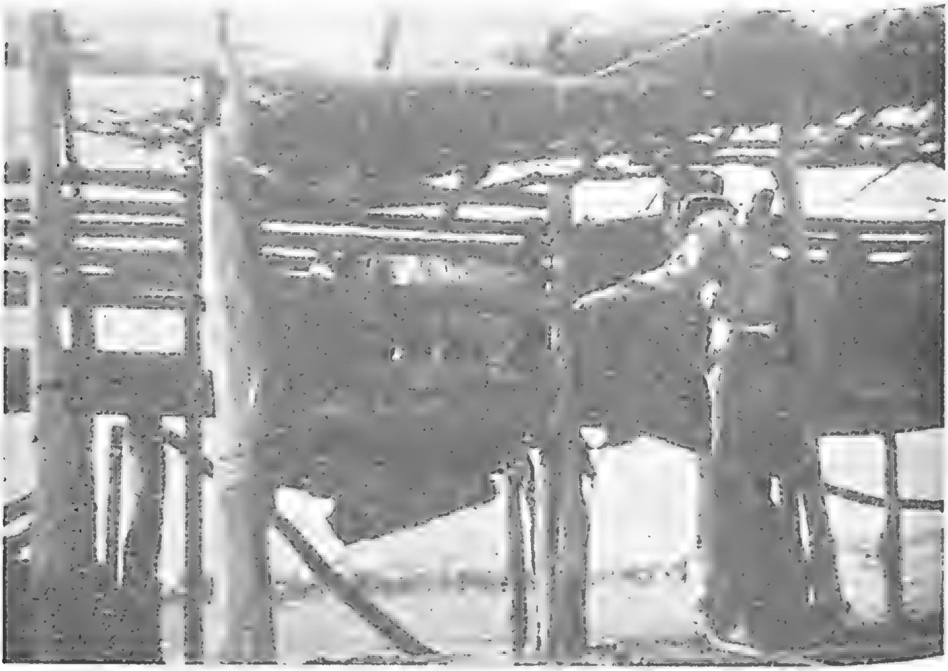


PLATE 133.
Elevated Jetting Race.

To Mix.

Place the 22 pints of cod oil in a 5 gallon drum and add the 1 oz. the sodium arsenite, shake well, and add the other ingredients as above. Should the weather be cold, heat at least some of the cod oil and add the sodium arsenite, shake well, and add the other ingredients as abvoe.

The mixture should be well shaken before using, and shaken up occasionally while in use, and applied with a brush or swab.

The conditions under which the ingredients were purchased allowed the specific to be sold, including the container and freight, at 3s. per gallon.

This mixture is meant for struck sheep only, but when used for lamb marking, it has under practical tests secured immunity from strike for some weeks. A preparation of this description should be an antiseptic as well as a healing agent, and afford some protection to sheep or lambs to prevent maggots developing from future strike.

If the specific applied cannot be scoured out successfully after being shorn, much trouble, inconvenience, and actual loss is incurred,

therefore the ingredients and quantities, as given, must be adhered to. When sheep are yarded for attention, those that have already been struck should be run off for special treatment.

It is also a most desirable safeguard to make a separate flock of all sheep that have been or are blown. Sheep should be kept free from parasites, and their general health maintained to the highest possible degree under existing conditions.

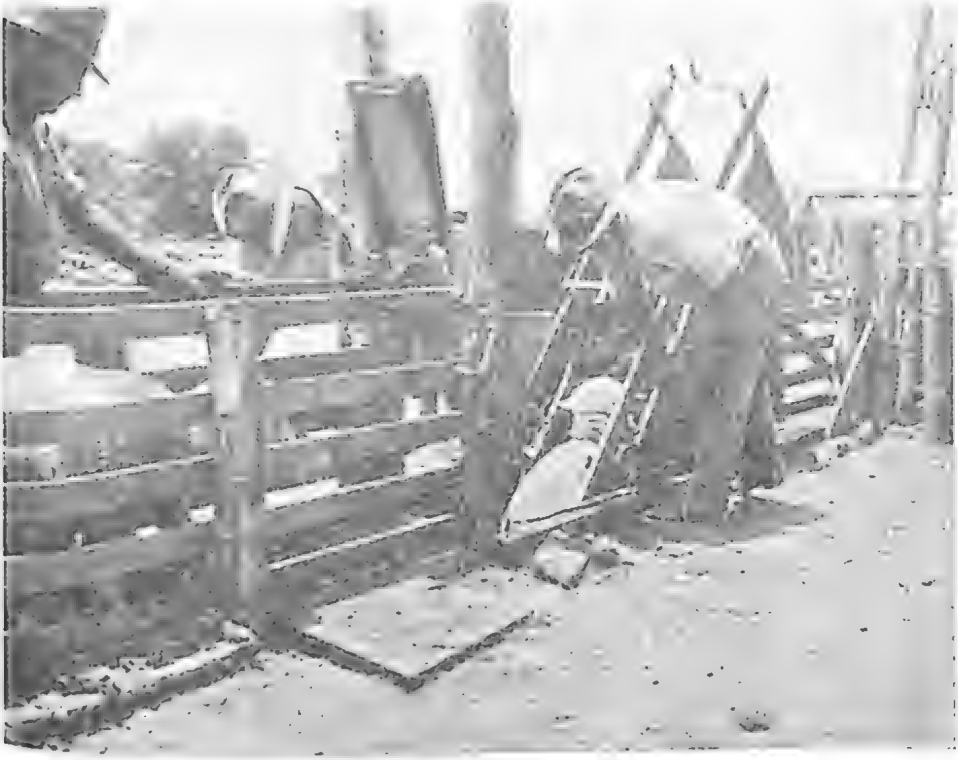


Plate 134.
The Shannon Tipping Dip.

During dry conditions, when grass is dry, healthy sheep should not be conducive to fly strike. If the grass is sufficiently good to maintain condition, the sheep should be healthy. If internal parasites are present in sufficiently large numbers to cause scouring, fly strike is likely to continue except under extreme hot or cold weather conditions.

It is a good policy to sum up seasonal conditions, watch for the first strike, and then, as soon as possible, adopt the method favoured and treat the whole flock, whether it be shearing, crutching, jetting, or dipping.

Recently the Council for Scientific and Industrial Research introduced the Glycero-Boric Blowfly Dressing, which is as follows:—

1 gallon (13 lb.) glycerine, 3 lb. powdered boric acid.

A thick paste is formed, which is then heated and stirred until all the boric acid is dissolved. This results in the formation of various borates of glycerine. After cooling, the clear solution should be kept in well corked bottles or tins, and should be used without dilution. This

new dressing is described as a colourless, odourless, rather viscous fluid, which is easily rubbed into the shorn area of a strike, and adheres readily to the fleece and the skin. It reduces the unpleasant odour, but kills the maggots rather slowly, 24 to 30 hours often elapsing before all maggots are dead, but they cease to worry the sheep immediately the dressing is applied. At present prices, the cost of the dressing will be not less than 11s. per gallon, which works out at about 2d. per sheep dressed.

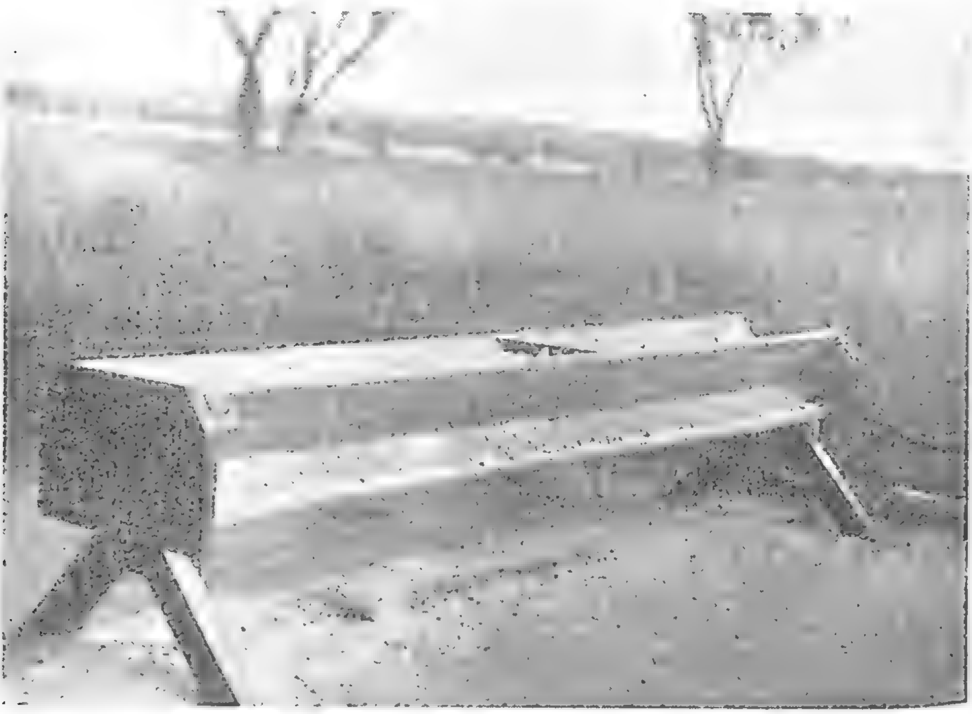


Plate 135.
Sheep Tick Trough Uncovered.

Small flocks, which are under close observation, can be handled successfully without much inconvenience or loss. In dealing with large flocks, it is most satisfactory, when the fly is first noticed, to treat all sheep in the flock.

Jetting, as Shown in Photograph.

Bringing the sheep together and dressing just those that are struck does not get over the difficulty, but rather causes an increase in the percentage of strikes. Dirty and struck sheep rubbing against those that are clean and free, only tends to increase susceptibility, therefore render all the sheep as proof against the fly as possible.

The latest addition to the method of treatment is that invented by Mr. J. Y. Shannon, Rodney Downs, Ilfracombe, and called a tipping dip. This consists of a tipping cage, which is fixed in a race over a dipping bath. As the sheep enter the cage, it is tipped by means of a man-powered lever (see photograph). The hind quarters of the sheep are dipped in the mixture, which carries from 3 to 4 lb. arsenic per 100 gallons of water, which is approximately half the strength used for jetting, and double the strength used for dipping. Mr. Shannon

claims for this, that not only does it kill the maggots on blown sheep, without removing the wool beforehand, but that it also kills large numbers of flies after dipping, and while still moist enough for flies to suck the poisonous moisture from the wool.

The Importance of Licks for Sheep.

The chief mineral requirements for sheep are salt, lime, and phosphoric acid, therefore any lick containing these ingredients in the correct proportion will be an advantage.

Plate 136.
Trough with Cover Adjusted.

The amount of salt or other mineral contained in the drinking water is an important factor when compounding a lick. The more salt in the water the less is necessary in a lick, even to eliminating it entirely, in which case meals can be added in order to induce the sheep to take their requirements of lime and phosphoric acid. Both of these ingredients are present in finely ground Nauru Phosphate in fairly even quantities, and also in bonemeal, which should be sterilised before being used in a stock lick. Bonemeal also contains a proportion of protein, which gives it an added advantage. No lick, however, should be expected to take the place of a food, but it is reasonable to expect it to give an added advantage to the food available. In supplying the mineral deficiency the lick will help to tone up the system, improve the digestive organs, create a better appetite, cause a greater amount of food to be consumed, and put it to better use.

The chief minerals must be supplied in fairly well balanced amounts, otherwise a craving still exists. The idea of salt or salt and lime supplying the deficiency and fully satisfying the craving is not correct, as phosphoric acid is just as important as other minerals under varying sets of circumstances. As phosphoric acid is one of the chief elements

deficient in our grasses when dry, and in shrubs and trees as proved by analysis, its inclusion in a lick is important, and it is the most economic way to supply it. In South African experiments it proved valuable in increasing the supply of milk, and caused an increased amount of roughage to be consumed. When sheep are on dry grass, or when feeding on scrub, a good lick should consist of the following:—

30 lb. coarse crude salt free from large lumps;
25 lb. finely ground Nauru Phosphate;
25 lb. Calphos or sterilised bone meal;
10 lb. wheat, maize or decorticated cotton seed meal;
5 lb. protein meal;
5 lb. Epsom Salts.

After mixing thoroughly, it should be moistened with molasses.

Many stock licks are manufactured in Queensland, all of which must be registered for sale here, and have the active ingredients stated on a label attached to the container. If an owner is acquainted with the analysis of the water the sheep are running on and the feeding value of the pasture, he should be able to form a fair idea of the suitability or otherwise of a lick.

When salt (sodium chloride) is needed, not more than 50 per cent. is necessary, while the phosphoric acid (P_2O_5) should show at from 10 to 15 per cent., and the lime ($Ca\ O$) at a little less, both of which can be supplied in the form of bone meals or phosphates.

An Automatic Lick Trough.

This lick trough has been designed by and used by Mr. Allan Campbell, Dalmally, Roma.

It is simple in construction, being composed of four pieces of 3 x 2 inch hardwood for legs and side supports, three pieces of 10 x 1¼ inch pine for sides and lick board and the short end pieces, which also help to brace the frame. The trough is about 7 feet 6 inches in length, and is capable of holding 1 cwt. mixed lick. The cover is a section of old water troughing, which was frayed at the joints, which fits down on the frame and is held in position by V slits fitting down on to stout, large-headed nails. When the troughing is pressed down it is secured by the reversed V gripping the nail.

Plate 135 shows the trough filled but not covered; Plate 136, the trough with the lid on.

WHAT THE YELLOW WRAPPER MEANS.

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Plate 137.—Young Farmers at the Department of Agriculture and Stock.

This interesting group of farm boys and girls, who were guests of the Royal National Association at the Brisbane Show in August, included representatives of Project Clubs in the three Eastern States. At the invitation of the Minister, Hon. Frank W. Bulcock, they visited the Departmental laboratories in which they were given practical demonstrations in the value of science as applied in the primary industries. Included in the group are the teachers in charge:—Miss A. E. Bott, Messrs. A. G. Aitcheson, E. J. Andrews (Queensland); A. L. Nicod (New South Wales); and J. A. [illegible] (Victoria). Mr. R. Wilson (Assistant Under Secretary, Department of Agriculture and Stock, Q.) is on the extreme right in the front row.

Chicken Raising Experiments.

WITH the object of confirming some results obtained in previous tests, and determining the most economic age at which the feeding of a high protein content could be discontinued, certain experiments were outlined by the Poultry Advisory Committee. These experiments were conducted at the Animal Health Station during the period 1933 to 1935, and embrace tests with light breeds and heavy breeds.

Experiments with White Leghorns.

Experiments conducted previously have shown that it is essential to feed a ration with a high protein content, to chicks in the early stages of growth, in order to obtain the maximum development. However, these experiments have also indicated that it might not be necessary to continue to feed the high protein ration after the chicks reach a certain age.

An experiment was initiated on 11th September, 1933, with the object of determining at what stage in the rearing of chicks the high protein ration could be replaced by a ration with a lower protein content in order to minimise the rearing costs. The all-mash system of feeding was adopted for these experiments, as this system facilitates the accurate recording of food consumption, and allows a homogeneous sample of food to be kept before the birds at all times.

The birds were housed in brooder pens (20 feet by 5 feet) for the first six weeks, after which they were transferred to larger pens (20 feet by 10 feet). The colony brooder system was used to rear the chickens. Feeding was commenced thirty-six hours after hatching, the food being placed in shallow trays about 1 inch deep. The size of these trays was increased as the chicks grew, until at four weeks old the chicks were given their feed in trays 5 inches deep. The food in the trays was covered with wire-netting to prevent wastage due to scratching.

Rations.—When deciding upon the ration to be used in this experiment, experience gained in previous experiments was used as a guide. Liberal use was made of milk products for the first six weeks, after which they were replaced by cheaper protein foods. The rations used were as follows:—

—	High Protein Ration (A).	High Protein Ration (B).	Low Protein Ration.
	Lb.	Lb.	Lb.
Maizemeal	56	56	63
Bran	12	12	13·5
Pollard	12	12	13·5
Dried buttermilk	14	5	2·5
Mebo meal	6	10	5·0
Lucerne meal	0	5	2·5
Cod liver oil	1	1	1
Salt	1	1	1
Cost per 100 lb.	9s. 8d.	8s. 4d.	7s. 9d.

Three hundred and twenty White Leghorn chicks were obtained at day old, were divided into four lots, each lot was weighed collectively, and placed in separate pens. The four pens were all fed high protein

ration (A), up to six weeks old, and conditions were kept as even as possible. The birds in each pen were weighed collectively at three-weekly intervals, and food consumption was recorded for the same periods. At six weeks old, the cockerels were removed and the pullets were placed in larger pens (20 feet by 10 feet). At this period definite changes were also made in rations fed. The lot in pen 1 were placed upon the low protein ration, while those in pens 2, 3, and 4 were supplied with ration high protein (B). At nine weeks of age the lot in pen 2 were placed on the low protein ration. Similar action was taken with those in pen 3 at twelve weeks and those in pen 4 at fifteen weeks. Consequently from this period onward all lots were being fed the low protein.

Table I. gives the average weights of pullets at the different ages, and the average total food consumption from the commencement of the test. The total food costs as well as the food costs per ounce gain in weight are also shown.

An examination of Table I. shows that there is no significant difference in the final weights of the birds reared under the different methods of feeding used in this experiment. When the live weight gains are considered in relation to the food costs, it is found that the birds, fed the high protein ration to six weeks only (pen 1), gave a slightly better result than the others. The differences, however, were not significant, as these differences were not greater than the experimental error which occurs under the group system of experimentation.

However, these experiments have indicated that there is no advantage to be gained by feeding the high protein ration after the chicks are six weeks old. There was no apparent difference in the general appearance of the birds in the different pens at maturity.

Due to the fact that no significant differences were observed in this experiment, it was necessary to duplicate this work in the following year. As a result, a similar experiment was initiated on 1st August, 1934, 300 day-old White Leghorn pullets being used in this case. The plan of the experiment was altered slightly, as experience obtained subsequent to the 1933 experiment had shown that the feeding of the high protein ration to 15 weeks was definitely of no advantage. The chickens were divided into three pens, each of which contained 100 birds. At six weeks old the birds in each pen were divided into two even lots, and each lot was placed in larger pens (20 feet by 10 feet). These, for reference, will be known as pens 1A and 1B, pens 2A and 2B, and pens 3A and 3B.

From this period onward, the birds in each pair of pens were treated in all respects similarly. The birds in pens 1A and 1B were changed to the low protein ration, whilst the birds in 2A and 2B and 3A and 3B were fed high protein ration B. At the age of nine weeks the birds in pens 2A and 2B were placed on the low protein ration, and similar action was taken with pens 3A and 3B at the age of twelve weeks; therefore, from the age of twelve weeks, all groups were being fed upon the low protein ration.

The duplication of the treatments was adopted in this experiment in order to determine the differences which might occur in two pens under the same conditions, due to experimental error. The birds in this experiment were reared in exactly the same manner and under the same conditions as the birds in the 1933 experiment, so that the results of the two experiments would be comparable.

TABLE I.

—	Pen 1.		Pen 2.		Pen 3.		Pen 4.	
	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Day old	1·25	..	1·25	..	1·25	..	1·24	..
At 3 weeks old	6·88	11·78	6·80	12·16	7·08	12·39	6·84	12·47
At 6 weeks old	15·37	40·71	16·20	42·00	16·00	42·18	15·89	42·76
At 9 weeks old	24·21	78·71	25·64	80·66	27·50	81·78	27·16	81·71
At 12 weeks old	31·60	122·41	30·21	125·56	33·00	132·48	32·84	126·61
At 15 weeks old	38·20	168·01	38·40	173·86	40·70	176·18	40·95	177·71
At 18 weeks old	43·90	220·41	43·60	233·36	44·50	228·68	46·30	231·11
At 21 weeks old	52·50	279·31	52·00	297·06	53·50	285·38	53·50	289·01
Total food costs	16·71d.		17·76d.		17·37d.		17·77d.	
Food costs per oz. gain in weight	·326d.		·350d.		·333d.		·340d.	

Table II. gives the average weights of pullets at the different ages, and the average total food consumption from the commencement of the test. The total food costs, as well as the food costs per ounce gain in weight, are also shown:—

TABLE II.

——	Pen 1.		Pen 2.		Pen 3.	
	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Day old	1·32	..	1·31	..	1·34	..
At 3 weeks old	6·08	11·36	6·00	10·84	6·02	11·82
At 6 weeks old	14·49	37·85	14·35	37·79	14·97	37·31
At 9 weeks old	21·70	75·70	21·37	72·55	23·44	74·18
At 12 weeks old	31·42	122·92	30·85	117·54	33·61	122·90
At 15 weeks old	38·86	173·69	38·62	172·26	41·46	175·70
At 18 weeks old	46·32	225·53	43·33	223·46	45·78	227·63
At 21 weeks old	52·60	283·49	51·77	280·60	54·87	286·91
Total food costs ..	17·30d.		17·25d.		17·85d.	
Food costs per oz. gain in weight	·338d.		·342d.		·334d.	

Table II. confirms the results obtained in the previous experiment—namely, that there is no definite advantage in the feeding of a high protein ration after chickens of the Leghorn variety reach the age of six weeks.

Table III. has been prepared to indicate the differences in weight that may occur among pens of birds reared and fed under similar conditions.

TABLE III.

Age.	Pen 1.		Pen 2.		Pen 3.	
	A.	B.	A.	B.	A.	B.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
6 weeks	14·79	14·83	14·58	14·67	15·39	15·15
9 weeks	22·04	21·36	21·41	21·33	23·13	23·75
12 weeks	31·50	31·33	30·91	30·79	33·83	33·39
15 weeks	39·00	38·72	38·73	38·51	42·35	40·37
18 weeks	43·87	43·36	43·27	43·40	46·00	45·57
21 weeks	53·04	52·17	51·82	51·72	54·87	54·87

Experiments with Heavy Breeds.

Previous experiments with heavy breeds indicated that it would be advantageous to feed a high protein ration to such birds for a longer period than Leghorns. With the object of determining if such were so, two tests were conducted during 1934-35, with two different breeds.

The general system of brooding, housing, and feeding was in all respects similar to the tests already outlined.

Australorps.

For this test, 275 day-old chickens were purchased. They were divided into three lots, as equal as possible in every respect, and placed in separate pens.

All pens were fed the high protein ration A until they were six weeks of age. At this period the males were removed, and the test continued with pullets only.

Pen 1 was at six weeks placed upon the low protein ration, and pens 2 and 3 upon the high protein ration B. At nine weeks, pen 2 was placed upon the low protein ration, and at twelve weeks pen 3 was treated similarly.

Table IV. gives the average weights of the pullets at different ages, and the average total weight of food consumption from the commencement of the test. The total food costs, as well as the food costs per ounce gain in weight, are also shown:—

TABLE IV.

—	Pen 1.		Pen 2.		Pen 3.	
	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Day old	1·30	..	1·29	..	1·30	..
3 weeks	6·25	10·81	5·98	10·48	6·07	10·69
6 weeks	16·84	44·21	16·76	43·73	16·11	42·34
9 weeks	28·87	90·32	27·36	85·81	28·43	84·89
12 weeks	37·60	141·06	39·92	141·23	39·92	136·59
15 weeks	49·53	204·32	49·88	201·9	50·47	196·63
18 weeks	55·18	264·85	57·28	261·02	57·36	256·78
21 weeks	65·06	327·64	64·00	324·02	64·09	319·33
Total food costs	20·01d.		19·93d.		19·87d.	
Food costs per oz. gain in weight	·314d.		·318d.		·317d.	

From Table IV. the only conclusion possible to arrive at is that there is no advantage to be gained by feeding a ration of a high protein content for a period any longer than six weeks. It must, however, be pointed out that the Australorp used in this test was of a small type. The standard weight of a pullet of this breed is 5 lb. There was an outbreak of coccidiosis in this test, and the lack of size may be attributed to this.

Light Sussex.

In this test 200 day-old chickens were procured. They were culled down upon receipt to 196, and then divided into two lots as equal as possible.

Each lot was placed in a separate pen, and the general system of management and the rations used for the test were similar to the tests already referred to.

Both lots were placed upon the high protein ration A for the first six weeks. The cockerels were then removed and the pullets in pen 1 placed upon the low protein ration and those in pen 2 upon the high protein ration B. At twelve weeks of age the pullets in pen 2 were placed upon the low protein ration.

Table V. gives the average weight of the pullets at different ages and the average total weight of food consumption from the commencement of the test. The total food costs, as well as the food costs per ounce gain in weight, are also shown:—

TABLE V.

—	PEN 1.		PEN 2.	
	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.
Day old	1·23	..	1·23	..
3 weeks	6·54	10·17	6·54	10·58
6 weeks	14·35	40·70	14·91	40·92
9 weeks	26·12	85·88	25·71	81·78
12 weeks	36·32	135·15	41·14	139·38
15 weeks	47·39	191·33	52·31	203·51
18 weeks	54·73	258·54	57·69	266·28
21 weeks	62·42	331·99	67·49	336·54
Total food costs	20·22d.		20·89d.	
Food costs per oz. gain in weight ..	·331d.		·315d.	

This experiment was also interfered with by an outbreak of coccidiosis, but from a study of the table there appears to be an advantage to be gained by extending the period of supply of a high protein ration for a longer period than six weeks.

Summary.

From these and preceding tests the following conclusions can be drawn:—

1. That a ration with a crude protein content of 18 to 19 per cent. (based upon average analyses of food stuffs) should be fed to—

   (*a*) Leghorn and light breed chickens for the first six weeks.

   (*b*) Heavy breeds for a slightly longer period (according to the size of the bird).

2. That the crude protein content of ration after the foregoing periods should be reduced to from 14 to 15 per cent.

3. That although no comparison test has been made, it has been noted in tests conducted that the inclusion of milk foods has a beneficial effect, and should be included in all rations fed to chickens in the early stages of development.

Cost of Production (White Leghorns).

In the conducting of experiments at the Animal Health Station, records have been kept of the cost of production as well as production. From these records, it is now possible to indicate the costs of rearing pullets, the profit over feed costs during the first year of production, and the profits over costs from second-year birds.

The Rearing of Pullets.

	£ s. d.	£ s. d.
Purchase of 313 day-old chickens	12 15 0	
Fodder costs for five months	14 3 0	
		26 18 0
Sale of cockerels—		
112 at 2d.; 47 at 6d.	2 2 2	
Sale—19 culled pullets at 2s. each	1 18 0	
		4 0 2
Total cost of rearing, exclusive of labour and plant, 116 pullets to laying age		22 17 10

Cost per pullet, 3s. 11.4d.

Profit Over Cost, First Year Production.

116 Birds.

	£ s. d.
1,783 dozen eggs, less allowance of 2 per cent. of production from breakages.	
Net return from sales	72 16 8
Food costs	35 15 0
Net return over feed costs	37 1 8

Net return per bird, 6s. 4.7d.

Profit Over Cost, Second Year Production.

85 Birds.

	£ s. d.
1,052 dozen eggs, less allowance for breakages of 2 per cent.	
Net return from sales	39 6 2
Food costs	24 14 0
Net return over feed costs	14 12 2

Net return per bird, 3s. 5.2d.

NOTE.—At the end of the first year's production, thirteen hens were culled, and at the end of the second year's lay, deaths had reduced the flock of 85 birds to 75. The market value of culled hens is in the vicinity of 3s. per pair, therefore the initial cost of the chickens should be credited with the sale of 44 pair of hens at 3s., a total of £6 12s.

The mortality in both years was greater than it normally should have been, primarily due to vent picking.

Costs of Producing Eggs Per Dozen.

	£ s. d.
Raising costs of pullets	22 17 10
Feed costs, first year	35 15 0
Feed costs, second year	24 14 0
	83 6 10
Less sales of hens	6 12 0
	76 14 10

£76 14s. 10d. produced 2,778 dozen marketable eggs.

6.6d. produced 1 dozen marketable eggs.

Manures and Fertilizers.

By E. H. GURNEY, A.A.C.I., Agricultural Chemist.*

BEFORE making a few statements concerning manures and fertilizers, it will be useful to make mention of some facts concerning plant life. Even casual observation of the growth in their natural state undisturbed by man, of the many and varied species of plant life, from giant tree to low-growing herbage, will yield information in connection with requirements of cultivated crops. It will be noticed, for instance, that particular trees thrive best on certain soil types, and under certain particular climatic conditions. Also, that some trees will flourish in soils of an extremely acid nature, and which soils may be more or less saturated with water, for long periods of time; the common ti-trees of our bush may be quoted in illustration.

Now, turning to plants cultivated by man, there are certain soil types and climatic conditions which are more suited than others for the successful growth of some of these cultivated crops. Thus on a somewhat acid soil, other soil conditions being favourable, successful crops of oats may be obtained, whereas good barley crops could not be grown on soil of the same degree of acidity. Again, as is well known, soils well supplied with lime, and not soils of an acid nature, are favourable to good lucerne growth, whilst maize will flourish on somewhat acid soils, other soil conditions being favourable.

Again, the root systems of the different crops have considerable variation. Thus lucerne has a particularly deep-rooted system when compared with maize, and mangolds are deeper rooted than turnips, and mangolds are thus enabled to obtain more plant-food from a soil than turnips. That different crops have varying power of assimilating soil plant-food is known, thus cereals and grass have a greater power of assimilating plant-food than root crops and potatoes.

From these briefly mentioned facts it will be understood the most successful returns of some crops result when certain soil conditions are present, but it must be also recognised that some soil conditions are essential for good crop growth, and that without such conditions satisfactory response to the applications of fertilizers will not be possible.

The essential factors above mentioned are good mechanical and biological soil condition.

A soil in good mechanical condition means a soil that remains in a more or less friable tilth after cultivation and rain, and has a good capacity for absorbing and retaining water. A soil in good biological condition refers to a soil that is well supplied with suitable bacteria.

Now, one of the most effective means of improving both these soil conditions is by increasing the humus content of the soil, and the mention of humus introduces the subject of manures.

When manures are spoken of it is generally understood that farmyard manure and bulky vegetable matter are referred to. These

* In a radio broadcast from A.B.C. National Stations 4QG, Brisbane, and 4RK, Rockhampton.

materials are composed mostly of organic matter containing nitrogen, together with a certain amount of mineral plant-foods. The organic matter of manures when ploughed into the soil is ultimately converted into humus by fermentation and bacterial agencies. The organic matter enables an increased bacterial population to exist in the soil, and also by increasing the humus of the soil, improves both the tilth and water-holding capacity of the soil.

Again, the humus, by inducing increased bacterial growth, increases the beneficial action of any fertilizer applied to the soil, as bacterial action aids in making more quickly available the fertilizing ingredients of the fertilizers, and also makes available for plants some of the otherwise unavailable plant food of the soil. For this reason, it is advisable to apply farmyard manure together with fertilizers, even if only a small amount of farmyard manure is available.

It is considered that one of the most important subjects confronting the cultivator of soil in Queensland at the present time is the maintenance or increasing of the humus content of the soil. The low humus content of a number of the soils forwarded by farmers to the Department of Agriculture and Stock for analysis, who state they cannot now raise successful crops, is one definite cause of their present poor crops.

The means by which the humus content of the soil may be supplemented are by returning all available farmyard manure to the soil, by ploughing in green manure crops and all plant waste material. Such means are, of course, well known, but can it be said that they are regularly and consistently adopted?

Animal manure is certainly now receiving more attention by the cultivator than in the past, as is evidenced by the increased use of sheep-manure by orchardists of Stanthorpe and other districts, and the dairy farmer is paying more attention to the collection and application of cow-manure to the soil for improvement in fodder crop returns, though there is considerable quantity of cow-manure allowed to waste in the grazing paddock. It would pay to collect this manure, as laying in the paddocks exposed to the weather most of its value as manure is lost.

Green manuring, as a means of returning humus to the soil, should exist consistently as a regular crop in any crop rotation system.

Waste or plant refuse is to a certain extent utilised by ploughing under any that happens to be laying on the land to be cultivated, but considerable amounts are wasted by not being collected, or by burning. A method of dealing with waste plant material that is being followed in some countries should prove valuable here. Briefly, the method is to put the plant material in a pit together with some nitrogenous and phosphatic fertilizing substance (for use by fermenting bacteria) and keeping the mass moist until it is well broken down by fermentation agencies; and in this form the vegetable matter is in a particularly suitable state to be applied to the soil.

Before speaking about fertilizers, a few remarks should be made in connection with lime. Though lime is present in all plant growth, usually applications of lime to the soil are not made for the purpose of lime, as plant food, as in most soils there is a sufficiency of lime

for plant requirement. Lime is applied for the following purposes:—Converting stiff, sticky soils into more friable tilth, neutralising a too acid soil condition, and making available some otherwise unavailable soil plant-food.

In connection with fertilizers, there are three plant-foods supplied commonly applied to the soil by means of fertilizers, and they are nitrogen, phosphoric acid and potash, as usually other plant food requirements are present in soils in sufficient amount. The three mentioned ingredients are declared in a fertilizer when sold in the order mentioned, thus a fertilizer declared as containing 4-12-10 means the fertilizer contains 4 per cent. nitrogen, 12 per cent. phosphoric acid, and 10 per cent. potash.

Nitrogen.

Nitrogen exists in a complexed combined form in plants. Different plants contain different amounts of nitrogen, thus lucerne has a higher nitrogen content than sugar-cane. Notwithstanding this fact, nitrogenous fertilizers are not required by lucerne, and sugar-cane frequently requires a nitrogen fertilizer for most successful growth. This apparent anomaly is due to the fact that lucerne obtains its nitrogen from air in the soil by means of bacteria that exist in the nodules attached to the roots of this plant. Again, the amount of nitrogen varies in the different portions of the plant, and also in the different stages of the plant's growth. Thus more nitrogen is found in the leaves than in the stem of the plant, and at later growth more in the seed than elsewhere. Further, in young plant-growth there is much more nitrogen than there is in matured plant-growth, and this is one of the reasons young grass-growth is so much more nutritious to stock than old matured grass.

Nitrogen stimulates the growth of stems and foliage, and for this reason fertilizers containing nitrogen in a quickly acting form are applied as top dressings during the growth of plants. Nitrate of soda and ammonium sulphate are fertilizers in which the nitrogen is quickly available to plants. The nitrogen in dried blood is not so quick acting as in the previously mentioned fertilizers, though its nitrogen is more quickly available to plants than the nitrogen of bone dust.

It has been mentioned that nitrogen stimulates the growth of stems and foliage; it is necessary to consider the effect desired to be obtained from the application of a fertilizer. In fodder crops plentiful growth of succulent stem and leafage is desired, therefore for such growth the crops must have, with other favourable conditions, a sufficient supply of nitrogen. A deep green colour in the leaf is an indication of sufficient nitrogen supply, though a more or less yellow colouring of the leaf is not always due to an inefficient nitrogen supply. In another case it may be that fruit trees are not showing sufficient growth; this would indicate the need for supplying nitrogen, but care must be taken that an excessive amount of nitrogen is not given, particularly if the trees at the time are not supplied with a phosphoric acid and potash sufficiency, for the nitrogen will increase tree growth, but development of flowers and fruit will be decreased.

Only the more commonly used nitrogenous fertilizers have been mentioned, and before speaking of other fertilizers it may be mentioned

that the ploughing in of green manure crops, particularly leguminous crops, supplies a considerable amount of nitrogen to the soil.

Phosphoric Acid.

The most commonly used fertilizers in Queensland containing phosphoric acid are superphosphate and bonedust. Superphosphate contains from 20 to 21 per cent. of phosphoric acid, which is in a water soluble form, and is therefore very quick acting. Bonedust contains from 20 to 25 per cent. phosphoric acid, which is not immediately available to plants, as this material is slowly decomposed in the soil. Frequently the most effect from the application of bonedust is noticeable in the year after application.

The effect upon plant growth of phosphoric acid is that it induces root-growth, increases crop-growth, and accelerates the ripening and maturity of crops.

It is to be stated that in some of our districts the soils, both cultivated and grazing, are deficient in phosphoric acid. In some cases good returns have been obtained with lucerne from the application of from 2 to 3 cwt. of superphosphate per acre, and big increase in clover growth in some pastures by the application of 2 cwt. of superphosphate per acre.

The good effect of superphosphate upon leguminous crops is stated to be caused by the soluble calcium phosphate of the superphosphate acting upon the nodule organism and increasing the chance of their getting to the roots of the legume and forming nodules necessary for good growth.

Potash.

This ingredient is obtained in Queensland in the fertilizers potassium sulphate and potassium muriate. Potassium sulphate contains 48 per cent. potash and potassium muriate 50 per cent. potash—the potash in both cases being water soluble, these fertilizers are quick acting. Potash seems to be connected with the formation of starch and sugar in plants, and in some cases with increased crop yield. Crops grown on soils deficient in potash are less resistant to the attacks of disease. The response to application of potash fertilizers is more noticeable on crops grown on light soils than in crops grown on heavier soil types.

EXPIRED SUBSCRIPTIONS.

A very large number of subscribers to the Journal expired in September, and have not been renewed. A further large number expires with this issue.

Subscribers whose term has expired have been continued on our mailing list, and a yellow wrapper on this month's Journal is an indication that their subscriptions are now due.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

COTTON PLANTING.

By R. W. PETERS, Cotton Experimentalist.

ONE of the most important operations of cotton-growing is the planting of the crop, yet it is surprising how little attention is given to it by many farmers. Unless the maximum stand is secured which is required for the variety or the soil type, the grower is handicapped in obtaining the fullest possible yield that the soil and seasonal conditions are capable of producing. Not only is it necessary to have a properly prepared seed bed to obtain a satisfactory stand of cotton but other factors have to be taken into consideration, and it is proposed to touch upon the most important of them in this discussion.

Time of Planting.

The general experiences of growers, and the results that have been obtained in Time of Planting Experiments at the Cotton Research Station in the Callide Valley, all indicate that planting as soon as conditions are favourable for obtaining and maintaining a good strike is advisable. Soil type also plays an important part, however. On old cultivations of fertile alluvial loams and clay loams and the average of the scrub soils, the best results over a series of seasons have been obtained from plantings made during late September and the first half of October in the Central district, and the latter half of October in the Southern districts. On old cultivations on the heavier clay loam slopes of the forest series, plantings up to mid-November can be made with good prospects of obtaining highly profitable yields. Likewise, plantings can be made later on new cultivations on all soil types; some instances of early December planting have been reported as yielding excellently. No advantage appears to be obtained by planting in August or early in September, even if climatic conditions are favourable, for the low soil temperatures generally retard germination to such an extent that usually early October plantings catch up with them, and often have a much better stand, especially if cold rains occur before the emergence of the early plantings. In some

seasons very heavy loss of terminals is experienced in the early September plantings through insect attacks, while later plantings suffer much less damage.

Methods of Planting.

Although there are several methods of planting which may produce good strikes under favourable conditions, it is believed that over a series of seasons the practice of waiting for a planting rain and then thoroughly harrowing the seed bed into a mellow condition before planting will give the most satisfactory results. This is particularly true if the ploughing has been done in time to conserve the winter rainfall. The harrowing after the planting rain leaves a surface that will warm up quickly, and also a better packing of the soil around the seed is obtained, which thus ensures ample moisture to effect germination. The harrowing also destroys early growth of any ordinary weed or grass seedlings in the properly prepared seed bed, and thus allows the cotton to come up in clean land and become thoroughly established without any competition from other growths.

It is appreciated, however, that in a dry spring a farmer with only limited planting equipment may have difficulty in planting a large acreage in good time if he waits for rain before planting. A useful method in such cases is—just before the usual sowing season, plant all the acreage in the dry surface soil except what can be planted in three days, which is frequently the length of period following the early storms in which there is sufficient moisture for good germination. As soon as a good rain occurs the portion not seeded is harrowed and planted, and then the dry planted area is harrowed as quickly as possible to break any crust forming before the seedlings start pushing up through the soil. Many growers have found this a satisfactory method, but an undesirable feature of planting in the dry soil is the danger of light showers occurring that will just start germination of the seed, and then if no more rain occurs a complete loss of seed results. Dry planting of valuable pure seed increase plots is, therefore, strongly advised against. Where dry planting of bulk stocks is done, it is recommended that at least 20 lb. per acre of undelinted seed be used, so that there will be ample to break through any crusts that may form with the first good rains. It can thus be seen that while dry planting has advantages, there are also serious disadvantages. The growers of larger areas are recognising this, and are tending to increase the efficiency of planting equipment to overcome the problem of getting their crop planted in good time.

Many growers planting only three to five acres adopt the practice of ploughing out shallow furrows before the planting period, sowing the seed by hand following the first good rain, and then covering it. The latter is done by either harrowing across the furrows to drag the soil in, or narrowing a walking scuffler so that it will fit in the furrow, and thus drag down the sides on to the seed. Either method will give a strike under favourable conditions, but it is doubtful if such a loose covering of the seed conserves the moisture sufficiently. As the occurrence of drying winds following the planting rains is frequently experienced, it can be seen that any planting method which does not assist in conserving the moisture around the seed is not to be recommended. For this reason the ploughing of shallow furrows following the planting rains, sowing the seed by hand and then cross-harrowing or scuffling

to cover the seed, is likewise not recommended. It certainly pays to adopt every practice that will assist in keeping the moisture to the seed and young seedlings.

Planting Equipment.

Undoubtedly for Queensland conditions the split-rim wheel two-row machine equipped with disc openers just in front of the planting spouts and wheels is the most suitable type of cotton planter. The discs push aside any clods and open up a firm, moist bed for the seed, while the big split rims of the main wheels, carrying the weight of the machine and driver, press the moist, mellow soil against the sides of the seed, but leaves a loose mulch on top of them. This is an ideal combination, for the pressed firm soil against the sides of the seed insures moisture from the subsoil coming up to them, while the loose mulch on top of them allows the young seedlings to come through without hindrance. The track left by the split-rim wheel is also of advantage if a heavy storm occurs before the seedlings appear. The little ridge of loose soil does not set so hard as do the pressed sides, hence in the drying-out processes the bottoms of the depressions where the rim presses dry last, and thus tend to curl up the pressed soil. This leaves a crack in the soil over the top of the seed, which allows them to come through with little effort, although the surrounding soils may be well caked.

This type of machine has been used at the Cotton Research Station for the last ten years, and good stands have always been obtained. In some seasons it has been necessary to plant following only 60 points of rain, yet an excellent stand has resulted, which has been maintained through a month of hot dry weather. As these machines can also be adjusted to plant other crops, they are very suitable for the general farmer.

On many of the farms in the older settled districts the one-row press-wheel planter is used for sowing maize and other seed that will drop through the usual six or eight-hole plate with which it is equipped. These plates are not suitable for sowing undelinted cotton seed, but if a six-hole plate with holes around $\frac{1}{2}$-inch in diameter is used, delinted seed can be sown satisfactorily if the cut-off plate is removed and a strip of $\frac{1}{8}$-inch steel—1 inch wide—is inserted in its place. It is strongly recommended that this type of planter be used rather than plant by hand in a furrow opened up by a plough, with all the accompanying loss of moisture.

Depth of Sowing.

The depth of sowing that has been regularly used at the Cotton Research Station is $1\frac{1}{2}$ to 2 inches, which has been found to give satisfactory germination under all conditions experienced. Where a two-row planter with split-rim wheels is used, it is believed that these depths will be satisfactory for most Queensland soils. In some of the very open crumbly heavy clay soils it may be advisable to plant $2\frac{1}{2}$ inches deep during very drying weather, for such soils if dry do not pack so well around the seed as do the finer soils. For the average soil, however, it is strongly advised against too deep a planting or too shallow a one. In inspections of commercial plantings which have failed to give a stand, it has generally been found that the seed had been planted too deeply—sometimes as much as 5 inches. In warm soils seedlings may come through this depth of soil under favourable conditions, but the seed

leaves are so tender after such a period in the soil that they are a light yellowish-green and burn off easily if hot, dry weather is experienced. Undoubtedly a lot of faulty stands are obtained each season simply through planting too deeply, or planting on such a poorly prepared seed bed that the seed are covered at irregular depths, some being too deep and others hardly covered at all. Frequent testing of the depth of planting and also examination of the seed spouts of the machine to see that the seed are dropping through evenly is certainly advisable.

Advantages of Delinted Seed.

The necessity for treating the seed in some manner that would allow of the use of the "walking stick" hand maize planter in planting newly burned scrub areas, resulted in machinery being installed at the ginneries to remove the fuzz, or "delint" the seed, as the operation is termed. Experiments carried out at the Cotton Research Station have demonstrated that the use of delinted seed in the regular planting methods is highly advantageous. The results indicated that the use of delinted seed ensures quicker germination, more even distribution of seed, and better ultimate stands than are obtained where undelinted seed is sown under identical conditions. Many farmers have been sowing delinted seed for some seasons, but some growers still use undelinted seed, in some instances because of the cheaper price. It is recommended, however, that the extra cost of the delinted seed is well worth incurring, particularly when planting in a season of light rainfall, for a markedly quicker germination is obtained with it. It is not recommended, however, that delinted seed be used when planting in the dry soil. The fuzz of the undelinted seed is of advantage here in preventing germination following light showers which would not provide sufficient moisture to maintain the seedlings until they make contact with the moist subsoils.

It has also been demonstrated that soaking seed just before planting for four or five hours in as warm water as one can hold his hand, appreciably hastens germination. Gains of from twenty-four to forty-eight hours in the appearance of the seedlings above ground have been obtained in experiments over several seasons. It is recommended that where one is doubtful if the surface moisture will last long enough to germinate the seed, and allow the seed sprouts to make contact with the moist subsoils, that soaked seed be planted.

Rate of Planting.

The recommended rates of sowing per acre on the seed application cards issued to growers are for cultivations—20 lb. of undelinted and 15 lb. delinted, and 10 lb. for planting in the scrub burns. These rates may seem high to one who has used them under favourable conditions, for undoubtedly a very solid stand of seedlings may be obtained with them. On the other hand, even 20 lb. of delinted seed may barely give a final satisfactory commercial stand in a cold, wet spring, or in a season when false wireworms and cutworms are operating to any extent. One has only to try to obtain an even spacing of single plants 2 feet apart in a commercial field to appreciate how uneven a strike is obtained with the average planting. A fair number of farmers believe in planting at a light rate of seeding and not thinning out the plants. The practice is not recommended, however, not only because of the

unsatisfactory strike that is often obtained, but also because, so far, the evidence obtained in thinning tests indicates that spacing out the plants when they are 5 to 7 inches tall is of benefit not only to yields, but the quality of the fibre produced. It is easy to thin out a stand that is too thick, but generally impossible to make up for a skippy stand, and one should always sow heavily enough to make sure of obtaining sufficient plants. A rate of 12 lb. per acre of delinted seed appears to be the least amount that should be planted in most cultivations.

Spacing of Rows.

The spacing of 4½ feet between rows, which is in general use, appears to be a fairly satisfactory one for most soils in all districts. On some of the forest clay loam slopes, where rank plant growth seldom occurs, it may be possible that a spacing of 4 feet between the rows will be satisfactory, particularly where early ploughing has allowed of a good conservation of the winter rainfall. It is pointed out, however, that in dry seasons the large lateral roots of the cotton plant extend remarkable distances under the surface in search of moisture, so it may be advisable to space the rows wider on the poorer soils in order that the plants can obtain more moisture during stress conditions. Recent experiments in the United States have shown that in dry seasons greater yields of maize are obtained from the widely spaced rows—6-feet widths proving the best in some cases. Experiments testing the value of wide spacing of cotton rows are being carried out in Queensland, and it is suggested that every grower try out the idea on his own soils.

Direction of Rows.

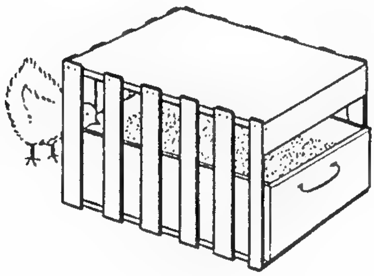
Experiments carried out for several seasons failed to demonstrate that there was any advantage to be gained by planting in any particular direction. It is recommended, therefore, that such points as planting so as to lessen soil erosion, and obtaining the longest rows to reduce loss of time in turning the cultivator at the ends of the rows, should be the main consideration in determining the direction of the rows. Undoubtedly serious loss of soil is occurring in many cotton fields through the rows being planted up and down the slopes instead of across them. Not only does the latter method retard the flow of water and save the surface soils, but the strain on horses during the cultivation operations is greatly lessened. Planting on excessive slopes should be avoided, for the types of soil and the moisture content of the different portions of the field are so varied that cottons of marked diversity of character and length of staple are produced. Where it is necessary to plant on a slope the rows should be planted across it at an angle that will give a fall down the row of about 4 inches for every 100 feet. This retards the flow of the water enough to prevent serious loss of soil except during very severe storms. As a further check on the run-off of storm waters, strips of permanent grasses or annually sown fodder crops should be grown at intervals of 200 or 300 feet in the cotton parallel to the rows. This greatly reduces the flow down the slope, and the thick crops trap the soils which would otherwise be washed away.

Conclusion.

The general position regarding planting cotton may be summarised as follows:—

1. The land should be ploughed in time to obtain full benefit of any winter rains—ample moisture in the subsoil allows of safe planting on relatively light rainfall.
2. Planting in the dry soil, while having advantages for a grower of a large acreage, has definite serious drawbacks, and should be avoided if possible.
3. Harrowing after the planting rain warms the surface, reduces evaporation, enables the seed to be planted in good tilth, and checks the early development of weed and grass seedlings.
4. Early planting is desirable but should not be done before the soil temperatures are sufficiently high to promote steady growth of the seedlings.
5. Planting following the first good rain occurring after the third week in September in the Central district, and after the first week in October in the districts south of there, appears to be a safe period in most seasons.
6. Planting delinted seed is advisable except where one has to plant in the dry.
7. An ample rate of seeding should be used—it is easy to thin out too thick a strike of seedlings, whereas a thin or skippy stand of plants is a handicap throughout the season.
8. The best depths of sowing are from 1½ to 2 inches in a mellow, moist seedbed, using a planter with disc openers, and split-rim wheels to press the soil around the seed.
9. The rows should be spaced 4½ feet apart for the bulk planting, but widths from 4 to 7 feet should also be tested.
10. Severe slopes should not be planted to cotton—they are more profitable under grass. On slight slopes the rows should run across at a slight angle rather than up and down the slope, as they will help to retard the flow of water and thus reduce loss of the valuable surface soils.

A DRINKING TROUGH.



Made from a kerosene tin and case, which will keep water for the chicks cool and clean.—"The New Zealand Farmer."

Pasture Improvement.

THE three-year term of the Pasture Improvement Committee which had operated since 1931, came to an end in June last, and a new committee was appointed to continue the work in progress, and to initiate fresh experiments.

The present Committee was formed too late in the year to enable it to embark during 1934 upon experiments directed towards the provision of winter pasturage, but a start was made in the autumn of 1935 with a number of winter pasture species and manurial trials. Certain trials with summer pastures were set in motion, and in the spring of 1934 a number of lucerne manurial trials were launched.

WINTER PASTURE TRIALS.

The Committee adopted a policy of laying down a number of experimental plots, each 2-5 acres in extent, on farms in the chief dairying and sheep raising centres of South-eastern Queensland. The object of the trials is to determine the most suitable introduced grasses and legumes for sown pastures for winter grazing, and the value of lime and/or fertilizer treatments of various kinds. The standard plan provides for the testing over a three-year period of the grasses and legumes which previous experience has indicated to be most suited to the particular districts of the trials. Most trials comprise replicated plots of each of three mixtures of a grass and a legume. Thus, on the coast the mixtures sown were:—

Phalaris tuberosa and lucerne;
Bromus marginatus and lucerne;
Italian rye grass and red clover,

while on the Downs and in sub-coastal areas the last mixture was replaced by a Wimmera ryegrass-lucerne mixture. The lime and fertilizer treatments comprised replications of plots treated as follows:—

Lime, 1 ton per acre ..	+ Superphosphate 2 cwt. per acre;
Lime, 1 ton per acre ..	+ Shirley's No. 9 Fertilizer, 3 cwt. per acre;
Superphosphate alone ..	— 2 cwt. per acre;
Shirley's No. 9 Fertilizer	— 3 cwt. per acre.

At the Farm Training School at St. Lucia, near Brisbane, a comprehensive winter pasture species and manurial trial has been laid down, the fertilizer treatments including muriate of potash as well as superphosphate and Shirley's No. 9 Pasture Fertilizer.

In addition to the major trials dealt with above, the Committee has laid down on each trial farm a number of plots of various grasses and clovers to serve as a demonstration of the possibilities of the different species in different parts.

PASPALUM RENOVATION AND MANURIAL TRIALS.

Two separate trials have been commenced at St. Lucia on old paspalum pastures. The trials are designed to determine the value of renovation and of liming and/or top-dressing of paspalum pasture, and the possibility of incorporating winter-growing legumes in renovated paspalum stands.

A further experiment involving the broadcasting of red clover seed on a renovated paspalum pasture is in progress in the Gympie district.

MISCELLANEOUS PASTURE IMPROVEMENT TRIALS.

(a) Plant Trial and Demonstration Gardens.

Material from the garden maintained at the Acclimatisation Society's Gardens at Lawnton by the previous Committee was transferred to the Farm Training School at St. Lucia, and to the 100 odd rows so transferred have been added rows of a number of pasture plants received for trial from various sources, including the Council for Scientific and Industrial Research, the Waite Agricultural Research Institute, Messrs. F. H. Brunning Pty., Ltd., A. L. Clothier, C. T. White, and F. B. Coleman.

The Toowoomba City Council made available at Toowoomba an area of about one-quarter of an acre to enable a pasture demonstration plot to be established, and Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Toowoomba, to whose care the plot has been committed, has laid out a good variety of pasture plants. The value to the Darling Downs of this plot for demonstration and propagation purposes will undoubtedly be very appreciable.

The grass plots established at the Brisbane Showground by the former Committee, in co-operation with the Royal National Agricultural and Industrial Association, has been extended, and last year, as in previous years, provided an interesting display to a large number of farmers, pastoralists, &c.

(b) North Queensland Trials.

Applications to the Committee from two dairymen in the Daintree River district (Australia's northernmost dairying district) resulted in the laying down of trial plots of several grasses introduced from Africa at two centres. The progress made during the summer was very pleasing to one trialist particularly.

(c) Field Day.

In October a Field Day was held on Mrs. V. Andrew's property, "Drewendell," Nerang. A fair gathering of South Coast farmers attended and inspected with interest the work of pasture improvement accomplished on the property. Features of the farm included efficient subdivision of paddocks, renovated paspalum areas, top-dressed areas, winter pastures, and grass silage. Members of the Committee addressed those present on the subject of pasture improvement.

LUCERNE MANURIAL TRIALS.

Trials were instituted at Yangan, Harristown, Wellcamp, Goodger, Brooklands, Lanefield, and Toogoolawah, the layout in most instances providing for replications of eight treatments as follows:—

1. Lime, 1 ton per acre;
   Superphosphate, 2 cwt. per acre;
2. Lime, 1 ton per acre;
   Superphosphate, 1 cwt. per acre;
   Bonedust, 1 cwt. per acre;
3. Lime, 1 ton per acre;
   Shirley's No. 9 Mixture, 3 cwt. per acre;
4. Lime, 1 ton per acre;
5. Superphosphate, 2 cwt. per acre;
6. Superphosphate, 1 cwt. per acre;
   Bonedust, 1 cwt. per acre;
7. Shirley's No. 9 Mixture, 3 cwt. per acre;
8. Control.

At Lanefield muriate of potash treatment was included in the trial.

For the most part seasonal conditions were adverse to lucerne growing, and the greatest number of cuttings obtained under supervision from a single experiment was three, and this in the case of only one trial. As a consequence the data collected from the trials during the period under review are insufficient in themselves to provide any indication of the value of the various treatments. However, they will prove of use when taken in conjunction with results obtained during the remaining two years of the trials.

CO-OPERATION.

The Committee on a number of occasions during the past year made available to the Experimentation Committee of the Department of Agriculture and Stock the services of its Field Officer for field work in connection with pasture and fodder crop trials conducted under the aegis of the former body.

OBITUARY.

During the year the death occurred of Mr. F. F. Coleman, who was a member of the Committee and of the former Committee. The loss of such an enthusiastic and capable member was keenly felt by fellow members.

ACKNOWLEDGMENTS.

The thanks of the Committee were due to the following firms and persons for assistance during the year, viz.:—

Messrs. A. C. F. & Shirley's Fertilizers Ltd., Brisbane (Financial Grant.)

Messrs. Nitrogen Fertilizers Pty., Ltd., Sydney (Financial Grant.)

Messrs. Australian Fertilizers Ltd., Sydney (Services of Mr. F. H. Dalton.)

Messrs. H. V. McKay, Massey-Harris Ltd., Brisbane (Loan of Sunpalm Renovator.)

Messrs. Pacific Potash Ltd., Sydney (Free potash.)

Agricultural Chemist (Soil and pasture analyses.)

Toowoomba City Council (Lease of land.)

Mr. J. A. Kerr, Supervisor, Farm Training School, St. Lucia (Facilities and assistance for pasture trials at St. Lucia.)

Mrs. E. Andrews, Nerang (Field Day.)

THE ROTHAMSTED REPORT FOR 1934.

THE Rothamsted Experimental Station is our leading Institute for the study of soil science, plant nutrition, and plant disease. Its activities cover a wide field. There are the well-known experiments on the parent farms at Rothamsted and Woburn, amplified by similar trials at a number of outside centres. In addition the laboratory workers are applying the methods of chemistry, physics and biology to the many problems arising in crop production and utilisation. The appearance of the Annual Report for 1934 enables all interested in the land to obtain a clear view of the recent activities of the Station. Progressive farmers and their technical advisers will turn to the sections summarising the results of recent fertilizer investigations and continue with the detailed account of the field experiments of 1934. The scientific specialists, to whom the report needs no recommendation, will find a welcome feature in a series of review articles on the contribution of certain of the Departments to their respective branches of soil science. Dr. Keen writes on soil physics, Dr. Crowther on chemistry of soils and fertilizers, Dr. Thornton on soil bacteriology, and Mr. Cutler on general biology. From a publication so full of information as the present report, it is possible in a brief notice to mention only a few sections of immediate practical importance. Sugar beet growers will find much of interest in the results of the extensive fertilizer tests carried out in conjunction with the factories; nitrogeneous manures were the most important in improving sugar per acre in 1934. Accurate information on the effects of organic manures, and in particular of dried poultry manure, is now beginning to accumulate. Neither in 1933 nor in 1934 was the activity of nitrogen of dried poultry manure as great as that of sulphate of ammonia. Recent work on basic slags tends to show that their solubilities, as measured by the old citric acid test, is a good guide to their agricultural availability. Work on the maintenance of organic matter by ploughing in straw, or manures made from straw, or green manures, still continues. This side of the work, in conjunction with the continuous cereal plots testing the effects of bare fallowing, is of special bearing on soil fertility under mechanised cereal farming.

In addition to fertilizer tests, problems in general husbandry are being studied. For example, the preliminary results of comparisons of electric motors with oil engines for threshing are on record.

For the many field workers at home and overseas who are adopting the methods of field experimentation elaborated at Rothamsted, the report provides many examples of modern designs. There is also a useful statistical note on the construction and use of the summary tables relating to the field experiments. This section gives precision to such terms as ''interaction of fertilizers,'' and indicates the correct use of standard errors.

The report contains a useful summary of the Rothamsted work on virus diseases. Virus is almost certainly particulate, and different viruses are of different sizes. The particular virus examined is not an invisible stage of a visible bacterium, but virus is probably a form of living material. It has further been found that the inoculation of a plant with one strain of virus may protect it against a later inoculation with another more virulent strain of the same virus. The part played by insects in the transmission of these diseases is discussed in the light of recent experiments.

The volume contains 259 pages; its price is 2s. 6d. (British); and it is obtainable from the Secretary, Rothamstead Experimental Station, Harpenden, England.

The Conquest of Climate in Relation to the Sugar Industry.

Subjoined is the full text of an address delivered by Sir Raphael Cilento, Director-General of Health and Medical Services, at the inaugural meeting of the Fifth Triennial Congress of the International Society of Sugar Cane Technologists, which commenced in Brisbane on 27th August and continued until 3rd September:—

AS previous speakers have said, it is a very great pleasure to find the Fifth Congress of the Sugar Cane Technologists of the World gathered here in Brisbane this winter. Though we are small enough in terms of actual sugar production, providing not more than 3 per cent. of the world's total sugar, yet even that quantity is sufficient to direct attention to an experiment of world-wide importance, that is to say, production of sugar by white labour—a unique phenomenon. His Excellency has already referred to the fact that the output per man is greater than that in any other part of the world—again a unique phenomenon.

Most unique of all is the fact that not so long ago it was regarded as quite impossible for white men to live and work in the tropics at all. If you could see the (Brisbane) Moreton Bay "Courier" of 1852, you would see there interesting evidence of the psychology of the time in a statement, repeated on several occasions during a discussion on the acute shortage of labour. It had been suggested that every attempt should be made to attract workers from every part of the world, and among others, it was suggested that an attempt should be made to procure labour from Ceylon and Java, preferably by offering attractive terms to Eurasians, who at that time had little future in those countries. This suggestion was absolutely scouted on the ground that, having *some white blood,* they would never be able to live and work in a sub-tropical climate like that of Brisbane (!) for it was in the neighbourhood of Brisbane that sugar was first contemplated as a possibility. To-day, in this city, there are 300,000 people, who would be astonished to learn that eighty years ago it was considered impossible that they should live and work here.

Brisbane, situated at 28 degrees South, is the capital of Queensland, which extends up to 10 degrees South, so that it corresponds to the area in North America from Florida through Mexico and Panama, and our best sugar areas lie over the latitudes of Cuba. In Asia, Queensland corresponds to South China, French Indo-China, Siam, Burma, and India, as far south as Pondicherry. The sugar area from Mackay to Mossman corresponds roughly to that from Calcutta to Madras, or from Hong Kong to Manila, and our best sugar-growing areas lie, for example, over the degrees of latitude covered by the north part of the Philippine Islands. In the Southern hemisphere, Queensland corresponds in Africa to the area from Natal to Lake Nyassa, and the sugar-growing areas correspond almost exactly to what was formerly German South-Western Africa. In South America they parallel the lower reaches of Peru through Bolivia and Paraguay, the southerly parts of Brazil and the northerly parts of the Argentine.

It was not at all surprising that people who thought of Australia in terms of latitude, decided that the white man had no future, in

countries which had been so fatal to him through disease as some I have mentioned. It was decided in that belief to use the labour of the South Sea Islanders—the experiment almost wrecked this State.

Large sugar and banana-growing areas were taken up along the coasts, and a considerable number of natives from the neighbouring Pacific Islands were indentured as labourers. Queensland began rapidly to assume, indeed, in so far as it was colonised, the appearance of a typical "tropical country," with white overseers and massed native labour, and great numbers of speculators, prospectors, miners, and all the migratory riffraff that infest a new land in the hope of some chance El Dorado.

Even more typical were the diseases. Malaria flourished, filariasis and hookworm disease undoubtedly then became endemic, and the records of mortality and morbidity made Queensland the "dreadful example" of the 'eighties. Had one been looking for proof that the settlement of a tropical country was impossible to white man, one need have gone no further to have found a rich store of confirmatory evidence, and most of our present-day critics hark back to these primitive days for their material. The unhappy kanakas died in great numbers, bequeathing their diseases to their masters; the expectation of life among white males at birth was only 41.3 years, a figure more than 12 per cent. less than that of the average for Australia; and the actual crude death rates for Queensland were enormously in excess of those of other States, in one year (1884) there being an excess of as much as 50 per cent.

With the gradual exhaustion of the mines there began a new era.

Thousands of that migratory horde that had swept into the country left it to follow their fortunes elsewhere. Thousands put what capital they had into pastoral or other pursuits, while thousands of others began to compete with the kanaka for a livelihood as unskilled labourers, and to demand that, in the land of their birth or adoption, they should have the right to earn a living without sacrificing that standard of living that distinguished them from their competitors.

Since the inauguration of the Commonwealth of Australia in 1901, the progress of settlement and development in tropical Queensland has been regular and extraordinarily rapid. The main mass of the population, in accordance with universal experience, is congregated most densely where communication facilities are greatest, and where the opportunities for the importing of necessities and the export of the produce won from the soil can be most readily effected.

The great advance such communications bring with them is nowhere better evidenced than in the sugar-growing areas between Ingham and Innisfail, where thousands of immigrants have established themselves since the opening of the line a few years ago that now connects them with the great railway system of Australia. (This line extends from Cairns in North Queensland to Geraldton in Western Australia, and touches every mainland State capital in Australia.)

Not only have the coastal areas benefited greatly, but this increase of population and facilities has permitted a great secondary development of the Atherton Plateau—a dairying and maize-growing area as large as the whole of the arable part of the State of Tasmania, pushed up half a mile above sea-level.

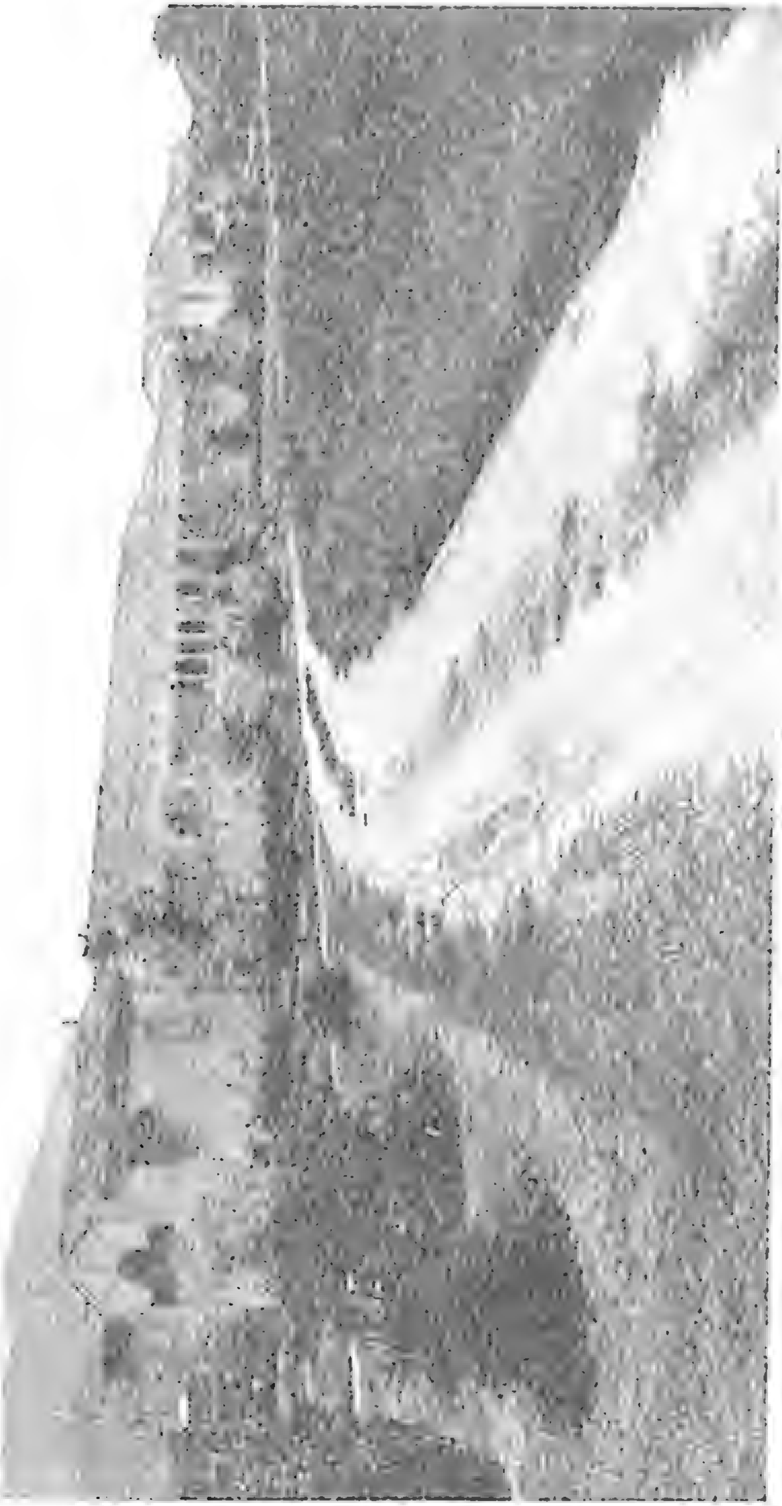


Plate 138.
The District Hospital, Mossman, North Queensland.

It has been said above that in the 'eighties tropical Queensland was the "dreadful example." It is at present the premier State in statistical vitality, and with its remarkable natural resources, its recuperative powers after bad seasons, its fertility, good harbours, numerous rivers and streams, and its relatively small population with high wage rates and standards of living, it bids fair to become in time the premier in economic status.

How has this change been brought about? The climate has not changed, nor is the country any the less within the geographical tropics. There are but three factors which have been modified, but these factors are undoubtedly those which essentially control the ability or otherwise of a white race to thrive in the tropics. They are—(1) The successful institution of adequate measures of tropical hygiene; (2) the exclusion of races with lower standards of life and higher rates of disease and reproduction; and (3) the continual increase in locally born inhabitants.

This third aspect of the matter introduces an element which opponents of white settlement find it opportune to ignore, but which is so obvious to those who live in the country, and so in accord with all experiences of biology, that it needs little demonstration. This is the process of complete physical adaptation, which most certainly results as a response to the continued influence on the organism of the altered physical stimuli of these low latitudes.

Australia's quarter-million tropical residents are reassured by the fact that one of the only particulars in which tropical Queensland has a death-rate higher than that of any other part of Australia is *in respect of old age.*

If one considers certain of the figures upon which the vitality of nations is assessed—the death-rate of infants under one year in Queensland, for example, as compared with the same figure for Australia as a whole—we find that in only one year of the last fifteen (figures available up to 1928) has the rate of mortality in Queensland been higher than the Australian average, and that in a year of exceptional drought in the State (1919). In the whole period the Australian average infantile mortality rate was 7 per cent. higher than that for Queensland, and the Queensland rate for 1925 (of 45 per 1000 births) is the lowest ever recorded for an Australian State. Not only is this the case, but the death-rates up to age nine last birthday, for the year 1920, 1921, and 1922 (the last available) show that the rate for Queensland in this regard also is 3½ per cent. better than that for Australia as a whole, both for males and females; and for the five triennia ending with the year 1925, experience is constantly improving as one would hope and expect. This is better set out in the following table:—

TABLE I.

Improving Experience in respect of Failures per 1000 of Queensland Children to reach the age of 10 Years.

Period	Males.	Females.
1911-13	116	101
1914-16	112	96
1917-19	106	88
1920-22	102	84
1923-25	87	70

Moreover, the full expectation of life at date of birth, which in the "dreadful 'eighties" was 41.3 years for males, has improved consistently since, both absolutely and in relation to the Commonwealth as a whole, and was, in 1922, 56. For the period 1920-22, indeed, the Queensland expectation of life figure exceeds that for all Australia. When the figures for infantile mortality and death rates are compared with those of so-called "ideal" climates, extraordinary results are obtained, as may be seen from the table that follows:—

TABLE II.

Comparative Death Rates and Infantile Mortality Rates in Various Countries (1928).

Country.	Death Rate.	Infantile Mortality.
Queensland	8.8	46
Netherlands	9.6	52
Denmark	11.0	83*
Norway	10.6	51*
Sweden	12.0	62
England and Wales	11.7	65
United States of America (registered area)	12.1	68
Switzerland	12.0	54
Belgium	12.8	92*
Germany	11.6	89
Scotland	13.3	86
Ireland	14.1	70*

(Note: Figures marked with * are for the year 1927.)

It was formerly charged against Queensland—gratuitously—that the average issue of wives here resident must inevitably fall below the average for Australia, or, indeed, any desirable figure. Actual fact, however, indicates that wives in Queensland for the periods under review, as tested by the census of 1921, produced greater issue than any other series, and that the average issue for tropical Australia exceeded that for all Australia.

The suggested climatic barrier to health and fertility, therefore, is found on adequate examination to be merely a translation into popular terms of certain figures recorded in other tropical countries—figures which arise, not from any climatic factor *per se,* but from the ordinary causes incidental in those countries to the presence of large native populations and a gross disease prevalence. In Australia the best figures available—the authenticated figures produced by the Commonwealth Statistician, C. H. Wickens—demonstrate that white men can live and thrive in the tropical parts of Australia, and that white women can accompany them without any loss of fertility, mentality, or physique.

When the Kanakas were repatriated and the last of them went in 1905-1906, it was considered that the doom of sugar had been spoken. With the best will in the world, white men could not stand up to work in sugar. The yield that year was 152,259 tons. The yield in 1934 was almost four times that amount—every ton grown, cut and milled by white labour. While we regard this white grown sugar and our successful white colonisation as extraordinary achievements, we must admit with the late Dr. Andrew Balfour, that far too little credit has been given to the Spanish and Portuguese explorers and colonisers of Latin America for laying the foundation and the experience for many of the

PLATE 139.

Cairns, the commercial centre of rich coast lands, North Queensland.

benefits which we enjoy to-day. One of the outstanding tributes to the capabilities of the white race in the tropics is provided in the province of Camaguey in Cuba, where, as Dr. Juan Guiteras pointed out in 1913, a long continued series of Spanish families have established themselves without any loss of physique, mentality or fertility. Hintze demonstrates the same thing to have occurred in some of the West Indian Islands, and in German colonies in the South of Brazil. Here in Queensland we have been far more favoured by Nature than these were. We have not had to contend either with a mass of disease, nor with a large native population working at cut rates, or forced into economic slavery. Upon the sugar industry in North Queensland, we depend to a large extent for its colonisation, and the justification for its retention, and this must be done, too, not by reducing the workers to the level of the cheapest paid labour, but with the preservation of a standard of living considerably higher than that obtaining among sugar workers anywhere else in the world—a standard perhaps unduly high because, to a large extent, it sets a higher ruling rate on every other kind of activity and labour in the North. This, however, is an economic question, with which I have no time nor occasion to deal in these few minutes.

It is only the relative absence of tropical diseases that has made our success so assured, and it is on the exclusion of disease that we depend for continued success.

Malaria, fortunately, stops just North of the main sugar growing districts. Hookworm is rife to an extent that has occasioned the Government much concern for many years, and hundreds of thousands of pounds have been spent upon providing facilities for the people. The short period fevers, Weil's disease, 7-day fever, endemic typhus, and so on, have been established in the North for two generations, but very rarely do they rise to epidemic proportions. In 1907 there was a big outbreak; and in years of heavy rainfall, since then the vegetation grows rankly, rats become numerous, and these diseases reach a fairly high level. The greatest of these outbreaks occurred last year, when 150 cases, diagnosed as Weil's disease (but probably not all Weil's disease) threw the whole area into a state of panic, from which it has not yet recovered. This year there have been only seven cases microscopically proved, and these were so mild that the patients had left hospital before their disorder had been proved; it was indeed the typical sort of "cane fever" of every other year. (One case occurred at Gordonvale and six (6) at Ingham.)

The Government has spent a considerable amount of money on a campaign for the eradication of rat harbourage, rat food, &c., and the most recent of our poison campaigns has distributed 2,500,000 effective baits, apart from those not taken by rats; and burnt the matted long-continued harbourage over 72 miles of roads.

I will conclude by saying that, for me personally, it is a great pleasure to meet countrymen of those interesting pioneers on the medical side—Juan Guiteras, of Cuba; Chamberlain, of the Phillippines, and Gorgas, of Panama; Fleming, of Rhodesia; and Hintze, Wagemann, and De Almeida, of South America; De Langen, Smut, and De Vogel, of the Dutch East Indies; and that long series of British and Indian scientists who have made the research activities of their laboratories famous. We hope to profit immensely from that enthusiasm that has brought you so far afield as Australia, and by that knowledge that has made your coming so epic an incident to us.

Economics of Sugar in Australia.

Following is an address delivered by Sir Philip Goldfinch at the inugural meeting of the Fifth Triennial Congress of the International Society of Sugar Cane Technologists in Brisbane:—

BEFORE plunging into the present-day economics, which so often neglect history, I propose to give a short history of sugar in this continent.

Sugar-cane was not indigenous to Australia. It is believed that it was first introduced in 1817, though raw sugar was not produced on a commercial scale until 1886, when Captain Louis Hope made small quantities at a mill near Brisbane, in Queensland. Prior to this date the sugar requirements of the country were imported. The first refinery was operating as early as the year 1840 and handled imported raw sugars. It was not until 1868 that cane growing and the manufacture of raw sugar were developed to an extent which justified them being called one of Australia's industries. In the ten years following 1868 over 100 sugar mills were built on the coastal belt of Queensland and New South Wales. Later, in the early 'eighties, there were probably 200 sugar mills at work, and it can be said that not one of these plants is in existence to-day.

The industry was developed, and in its early stages was carried on with black labour, but some years before the federation of the States of the Commonwealth, which took place in 1901, the people of this country determined for a "White Australia." Queensland came into Federation on the undertaking that her chief industry, sugar production, should be adequately protected fiscally against competition of sugar produced by black labour in other countries.

In 1901 import duties were imposed as follows:—

£6 per ton on cane sugar.
£10 per ton on beet sugar.

In 1902 an excise duty of £3 per ton was imposed and a bounty or rebate of £2 per ton was granted in respect of raw sugar produced wholly by white labour.

In 1907 the excise duty was increased to £4 per ton and the rebate or bounty was increased to £3. This increase sped up the change from black to white labour, and it can be said that by 1909 the coloured men had been repatriated to their island homes.

The excise and bounty were abolished in 1913, but the import duty were maintained.

Thus started the experiment of producing in tropical and sub-tropical Australia cane sugar wholly by white labour, with the undertaking from the rest of the Commonwealth to protect the industry and enable it to live under not only white labour conditions, but presumably under Australian white labour conditions, which provide a standard of living unquestionably higher than in any other part of the world.

The next important change in the economics and control of the industry occurred in 1915, the second year of the Great War.

Prior to 1915 the control of the industry had been virtually in the hands of the Colonial Sugar Refining Co., Ltd., and the production of raw sugar was kept within the requirements of local consumption. The deficiency, which occurred in most years, was covered by the importation of raws to be refined in Australia, but small quantities of white sugar also were at times imported by merchants and-or through brokers.

The wholesale price of refined sugar was then fixed by the Colonial Sugar Refining Company based on world's markets, and in 1914 and the early part of 1915 the wholesale price of 1A sugar (i.e., first-grade refined sugar) was £21 per ton, and the retail price was 3d. per lb. The Company in that year purchased under contract the raw sugar produced in Queensland on the basis of giving the mills £13 2s. 6d. per ton of 94 net titre sugar when the duty paid price of 1A was £19 per ton with an additional 18s. per ton for every 20s. that the duty paid price of 1A was raised over £19.

The mills purchased cane from farmers at prices arranged mutually, and wages in the industry were fixed by Arbitration Courts.

In 1915, due to the devastation of the beet areas in Europe, and the engagement in war of agriculturists on the Continent, sugar prices commenced to rise, and the Australian Commonwealth Government co-operating with the Queensland State Government took complete control of the industry, and the industry has, in fact, been under the most complete Government control ever since.

It will be interesting at this stage to set out the position as it it existed when the Government took control—

The wholesale price of 1A was £21 per ton.

The retail price was 3d. per lb.

The price payable to the millowner for his raw sugar was £14 18s. 6d. per ton 94 net titre.

The corresponding value of cane of average quality was say 23s. per ton, and the minimum wage fixed by the Arbitration Court was 9s. 2d. per day of eight hours.

The first step taken by the Commonwealth Government was to impose a prohibition of imports and exports of sugar, and the Government then assumed the responsibility of purchasing from abroad sugar supplies to complete local requirements.

In 1915 the Government raised the wholesale price of 1A to £25 10s. per ton and fixed the price of raw sugar at £18 per ton f.o.b. mill ports.

In 1916 the wholesale price of 1A was again raised to £29 5s. per ton and the price for raw sugar payable to the millowner was increased in 1917 from £18 to £21 per ton.

In 1919 Australia's production fell, mainly through seasonal influences, to roundly 175,000 tons, and it was necessary to import approximately 117,000 tons at an average duty-free landed cost of £44 6s. 2d. per ton. This, of course, involved the Government in considerable loss, to recoup which in 1920 the Government raised the wholesale price of 1A to £49 per ton, and, shortly afterwards, to encourage greater production in Australia, the price to be paid to the Australian millowners for their raw sugar was raised from £21 to £30 6s. 8d. per ton. This price was reduced in 1923 to £27 per ton.

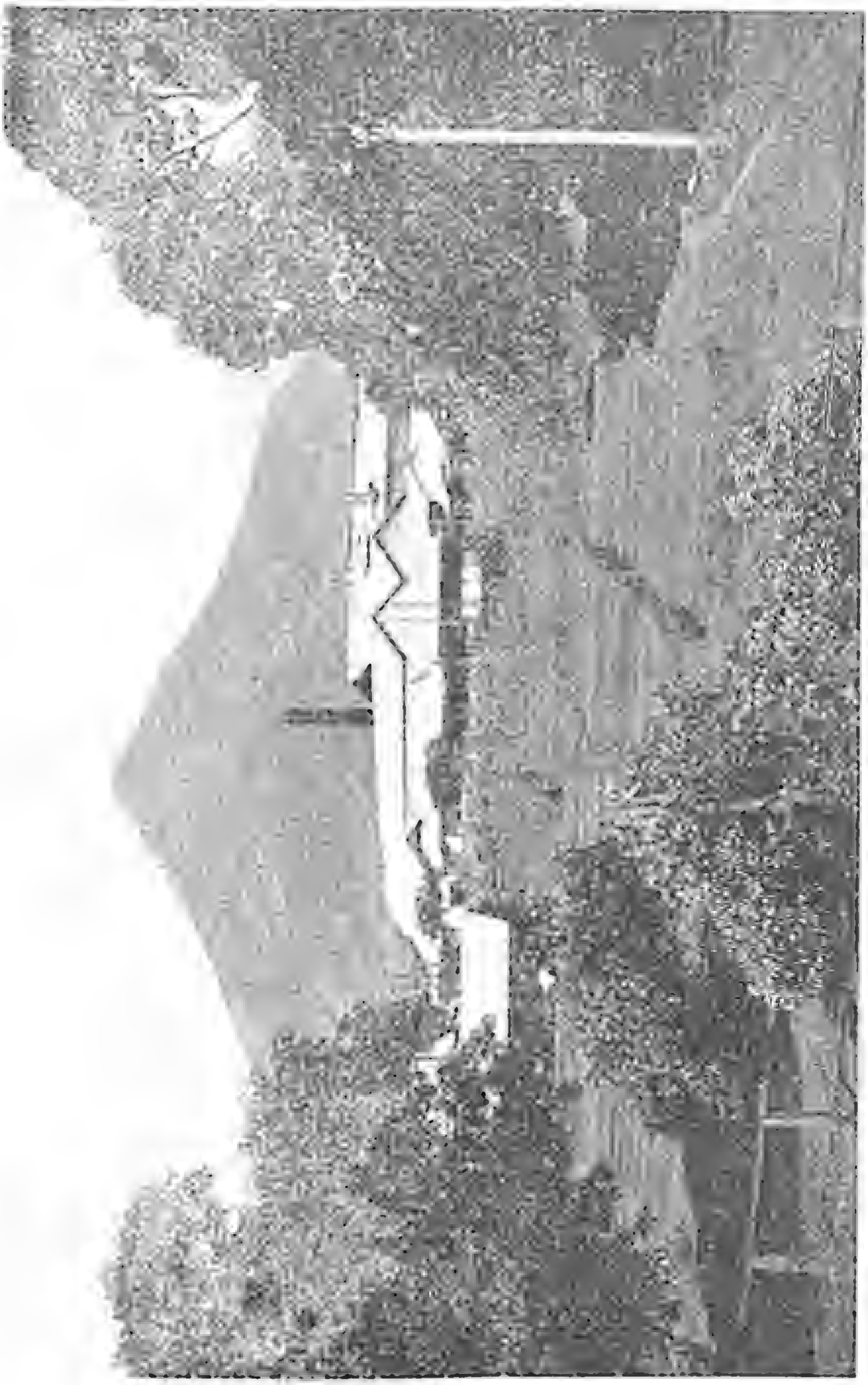


PLATE 140.

Mulgrave Sugar Mill at Gordonvale, North Queensland. Walsh's Pyramid in the background.

These conditions certainly encouraged the industry to expand, and by 1925 there was a surplus of over 200,000 tons to be exported.

Going back a little way, it should be said that in 1923 the Commonwealth Government handed over to the Queensland State Government the actual control of the industry, and with it the responsibility of maintaining adequate supplies of sugar for Australia. Since 1923 under agreements between the Commonwealth and Queensland Governments the former agreed to maintain the prohibition upon imports and exports provided the refined products were sold at prices agreed upon between the two Governments.

Coincident with the first substantial surplus in 1925, already referred to, the bottom fell out of the world's sugar prices, and the Australian sugar-producing industry found itself in difficulties through heavy losses on its exports. The condition is the same to-day, and I will now set out and explain the present economic position.

Sugar-cane is grown on the coastal belt stretching 1,000 miles from Port Douglas in North Queensland, latitude $16\frac{1}{2}$ degrees S., to the Clarence River in New South Wales $29\frac{1}{2}$ degrees S., but, taking the latest published figures 84 per cent. of the whole crop is produced in Mackay (latitude $21\frac{1}{4}$ degrees S.) and north thereof, and 47 per cent. of the whole is grown north of Townsville (latitude $19\frac{1}{4}$ degrees).

There are 33 sugar mills operating in Queensland and three in New South Wales, all making raw sugar only, and it can be said that the output in a normal campaign is 580,000 tons.

Except in the case of four mill-owning companies who cultivate their own estates in addition to purchasing supplies from farmers, cane is produced by growers numbering in round figures, 7,950, and the total area under cane cultivation is 325,000 acres.

The raw sugar industry plays an important role in the national life of Australia. It is the only medium for successfully populating that northern strip of tropical coastline which would otherwise be a source of weakness if not a vulnerable spot in the defence of the country.

Earlier in this paper it has been stated that the sugar industry is under Government control; the position is explained as follows:—

Wages in the industry are fixed by Arbitration Courts for workers in the field, mills, and refineries. Taking the rates prescribed for the Northern Division of Queensland, existing minimum rates of pay are—

(a) For field hands 16s. $8\frac{8}{11}$d. per day of eight hours.

(b) For mill hands 17s. $5\frac{5}{11}$d. per day of eight hours.

Cane harvesting is done at piecework or contract rates fixed by the same Arbitration Courts, and these rates range from 7s. 5d. per ton for cutting crops yielding 15 tons per acre and over to 15s. 4d. per ton for cutting crops yielding from five to six tons per acre. The work involved includes cutting, loading, and laying field tramlines.

The minimum rate for refinery in Queensland is 13s. 5 5-11d. per day of eight hours.

The prices for cane payable by the millowners to the growers are fixed by Boards appointed under the statutory authority of the Regulation of Sugar Cane Prices Acts. There has become established what

amounts to a standard scale of cane prices in Queensland, viz., 25s. 6d. per ton of cane of 13.5 per cent. c.c.s. with raw sugar at £14 per ton of 94 net titre, with increases and decreases of 1s. 8½d. per ton cane for each £1 above or below £14 per ton. This scale gives the grower approximately 71 per cent. of the value received by the millowner for his raw sugar.

Raw sugar, as it is manufactured, is acquired by and becomes the property of the Queensland Government, taken under further statutory authority and the millowner's equity in his raw sugar becomes a right to be paid for it at prices fixed and declared by Government proclamation, at present £23 per ton (reduced from £27 in 1931). The fact that there is a surplus production to be sold overseas creates complications in the determination of the price of raw sugar which can more conveniently be explained later.

There are no refineries owned by the Queensland Government (now the owners of all raw sugar) and the Government employs the services of the refining companies, first to take delivery of raw sugar on its behalf, to pay the millowners the proclaimed price, to transport such sugar to the refineries, to refine and sell the refined products at wholesale prices settled by the terms of an agreement between the Commonwealth Government of Australia and the Queensland State Government, wherein also the Commonwealth Government agrees, for the period of the agreement, to maintain a prohibition of imports of sugar from overseas.

For their services the refining companies are paid as follows:—

They receive payments to reimburse them for the out-of-pocket cost of freighting, insurance, &c., and of actual refining.

For management and to provide interest and depreciation on plant used they are paid 20s. per ton of raw sugar melted and refined.

For financing the whole undertaking they are paid rates per ton (varying with the crop circumstances) which provide a return somewhat less than bank rates of interest.

For selling refined products to the trade throughout the Commonwealth the refiners receive a commission of 7s. per ton of raw sugar melted.

The Queensland Government is represented in the above transaction by the Queensland Sugar Board, a board consisting of a chairman appointed by the Government, and three other appointees representing the mill-owning and cane-growing sections of the industry. Though the Corporation of the Treasurer of Queensland has the final responsibility, the Sugar Board has, as may be imagined, many onerous duties and many anxieties in its representation of the Government, particularly in connection with the sale of the surplus sugar, the details of which, however, are attended to by the Colonial Sugar Refining Company Limited.

In 1925 the chairman of the company said:—

> "As a contribution by the company to relieve the industry in its difficulties arising out of over-production, the company is willing to handle and finance the surplus sugar without charge for services and without interest."

This offer was readily accepted, and the company has continued to do this, and is doing so at the present time.

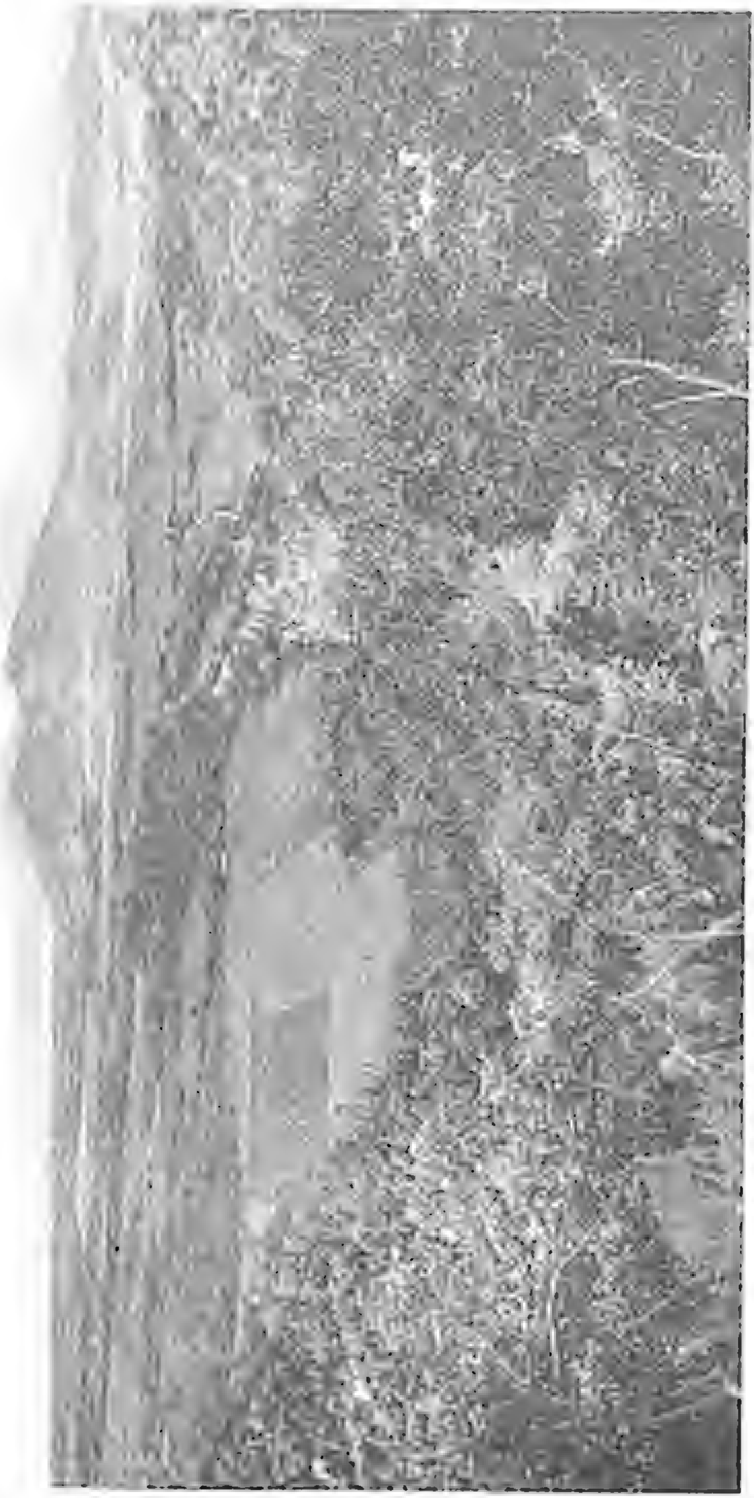


PLATE 141.

Cane Lands, Barron River Valley, Cairns District.

So much for the control of the industry, which it will now have been realised is reasonably complete, though there are many details of importance which cannot find space in such a paper of limited length.

Returning to raw sugar and the price complications referred to—

The Queensland Government is the owner, and therefore receives the proceeds of all sales in the Commonwealth of refined products, and to these total proceeds are debited the following:—

1. Discounts to wholesale merchants.
2. Rebates to manufacturers on sugar contained in products exported.
3. Substantial assistance to the industry engaged in processing fruit products.
4. Payments to refining companies as already described.

The balance, less the small administrative expenses of the Queensland Sugar Board, is available for payment for raw sugar.

It is most important to note here that this last paragraph applies only to the portion of the total production that is used and consumed in Australia amounting to between 50-60 per cent.

The remaining 40-50 per cent. is exported and a separate value per ton, i.e., proceeds less cost of freight, brokerage, &c., is established for this proportion of the production.

At the end of each campaign the exact proportions are calculated of the quantity consumed and used in Australia and the quantity sold overseas. Each sugar mill is credited with having delivered sugar for home consumption and export in the proportions thus calculated, and is paid for each proportion at the price determined as described.

There are six refineries in Australia—one at Bundaberg in Queensland, owned by the Millaquin Sugar Co. Ltd.—and the other five, one in each capital city on the mainland, are owned and operated by the Colonial Sugar Refining Company Ltd., who refine about 96 per cent. of the whole of the cane sugar consumed in Australia.

It has been said that the Australian Sugar Industry is uneconomic, but before any judgment at all can be passed there are several important related factors, some of which I have already touched on, which must be carefully weighed, and when all the facts are known and their significance appreciated, it becomes evident that the industry is playing a very important part in the general economic structure of Australian agriculture and industry, and that its economic basis is not widely different from that of the majority of the other sugar-producing countries in the world, and that this comparison applies particularly to such important countries as Cuba, U.S.A., Great Britain, Canada, South Africa, and practically the whole of Europe.

The stimulus afforded the industry in Australia by the embargo and price fixation is perhaps artificial, but many other Australian industries receive similar stimulus either directly or through the tariff. Moreover, the low export price for raw sugar which is so frequently quoted as an argument against the economy of the Australian system applies to only a small proportion of the world's sugar supply which

PLATE 142.

Green Island, Great Barrier Reef, near Cairns, Queensland.

is forced to seek an outlet in the open market. Actually only 8 per cent. of the world's sugar is sold at open market prices. The overwhelming proportion receives artificial assistance and is sold in its home market at prices much in excess of the open market price, and were all such measures of assistance to be removed there is no doubt at all that sugar would not be available at present open market prices. An economic level would be found, but simultaneously the production of sugar would pass to the most economic centres and the existing agricultural as well as economic balance of many countries at present producing sugar would be disorganised or modified; in certain cases to the decided detriment of the whole of the community concerned.

Australia does not differ largely from many other countries in this respect, and its policy with regard to sugar is not, after all, widely divergent from similar world-wide practices with relation not only to sugar, but to all commodities; in other words, all countries are absorbed in promoting means of livelihood for their populations, and the means provided must not only be suitable to the territory concerned, but if the country is dependent upon exports for its economic survival or for the maintenance of its standard of living, the product must be saleable in the desired markets.

Now in the case of sugar, to which the British Government has seen fit to give an Imperial preference over foreign sugar, there is at present a large unsatisfied market for Empire raw sugar in Great Britain, and subject to certain provisions the surplus sugar produced in Empire countries is assured of a market there. This has an important bearing on the general economy of the Australian balance of trade as the establishment of an assured credit of some £2,000,000 in London is a factor which cannot lightly be brushed aside. It may at once be asked why a similar procedure should not be adopted with other products from Australia, but in few instances can a parallel case be found in which (1) there is a certain market for the surplus at open preferential market prices; (2) the proportion of surplus to home consumption is such as to make the scheme practicable; (3) a substantial Imperial preference is granted by Great Britain and Canada; and (4) the surplus is saleable in preferential markets without displacing similar produce of Empire origin. Where the system *is* applicable it is already applied to other commodities not only in Australia but in almost all other important Empire or foreign countries, and if the Sugar Industry, either beet or cane, is to survive in Australia or in any other white labour country—or indeed in any country maintaining a decent standard of living—no other basis can in the face of world-wide practice at present be entertained. To answer fully the question of the economic soundness of Australia's sugar policy, which we have now seen is by no means unique or peculiar to Queensland, would involve a study of present-day world economics and politics which would be far beyond the scope of this address, but an endeavour has been made to indicate that the question cannot be dismissed by reference to and comparison with open market prices which can apply to only 8 per cent. of the world's sugar, and that there are many sound reasons why the present policy, while subject to modification with any alterations in the general economic position of the country, should be earnestly and unfalteringly pursued.

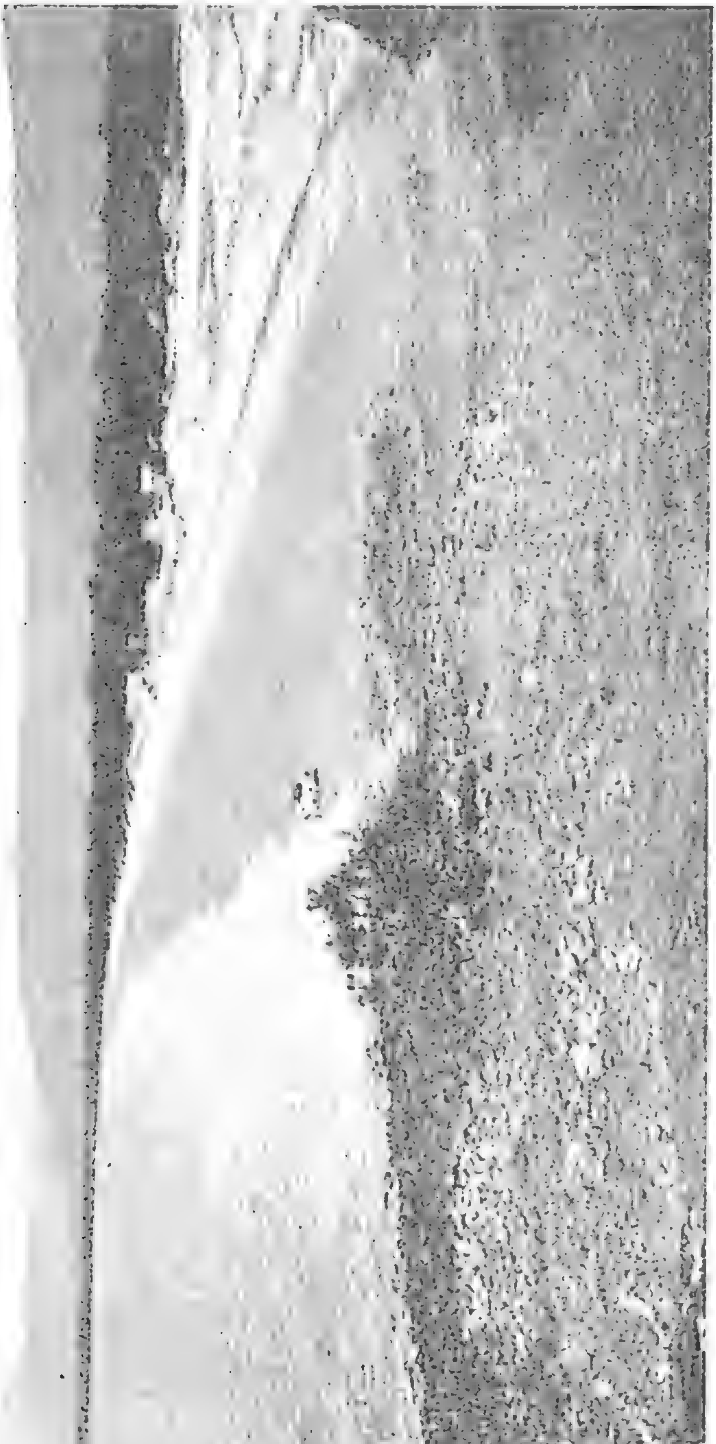


Plate 143.
The Beach, near Port Douglas, Mossman District, North Queensland.

Is there over-production? Such a question seems absurd to ask because the answer is so obviously "Yes"—but a yes with several important qualifications. For instance, is Europe—is the world—consuming all the sugar it requires? The answer is just as assuredly "No." More than one country has by fiscal enactments made sugar a luxury that only a small percentage of the population can afford to buy, and again, lack of buying capacity owing to disturbances in currency and credit has no doubt limited the use of sugar in countries that might otherwise become large consumers. The attempts that have been made to raise the level of sugar prices by limiting or reducing production may seem the easiest and quickest means for obtaining relief, but the writer frequently wonders whether these are sound methods and whether the trouble is not deeper seated.

One thing is certain, the way out is not an easy one.

TREES ON THE FARM—THEIR AFTER CARE.

Any care exercised in planting trees is rendered ineffective unless they are protected from injury, and a degree of assistance is given to their proper development. The chief danger threatening young trees on the farm and pastoral areas is damage by stock, and it is useless making plantings unless the whole of the area is effectively fenced off from animal invasion. Stock not only destroy or injure young plants, but by trampling and packing the soil nullify the effect of preparatory cultivation.

The fence should be stock-proof, and either permanent in character or sufficiently well constructed to keep out stock until the trees are beyond the reach of the largest animals. As the trees grow older, stock can be admitted from time to time with advantage, as they serve to destroy weed growth and lessen the danger of fire by removing surface litter.

A permanent fence with a properly constructed gateway permits the regulation of such entry. Where it is only intended to protect the trees until sufficiently well grown to be proof against stock damage, a barbed wire fence is very effective. Where single shade or ornamental trees are planted out they should be protected by some form of tree guard. Protecting fences or tree guards should be provided for before the young trees are planted out.

The area under trees should be cultivated two or three times a year, especially for the first two or three years, in order to keep down weeds, prevent undue evaporation of moisture, and maintain good soil conditions. Weed growth in the early stages is particularly injurious, as it tends to suppress or completely destroy young tree growth, especially of the slower growing species. Weeds, moreover, increase the danger from fire, and reduce the available moisture supply. Under certain conditions, on the other hand, weed growth is of value in providing shelter for trees which are liable to injury by excessive heat, frost, &c., and on slopes and shifting sandy soil are of assistance in binding the soil. Generally speaking, however, the trees should be kept free from weeds as far as practicable.

Where a cultivator can be used, operations are simplified, but where it is not possible to employ a machine, the trees should be periodically hoed around with a mattock or similar implement. Cultivation is particularly desirable in dry areas, in order to conserve soil moisture, and besides resulting in more rapid and better growth, frequently makes the difference between success and failure. The soil round the trees should always be loosened after rain so as to restore the surface mulch. Cultivation may usually be discontinued as soon as the canopy of leaves offers protection to the soil, or when surface roots interfere with operations.

In rabbit-infested country the trees may have to be protected by netting.—A. and P. Notes, N.S.W. Dept. Agric.

BANANA GROWING.

THE ONE-BUNCH ONE-SUCKER SYSTEM.

By H. BARNES, Director of Fruit Culture, and J. H. MITCHELL, Inspector under the Diseases in Plants Acts.

This method of growing bananas was first suggested by the late Mr. J. Mitchell, senr., at one time manager of the Bribie Island State Nursery. During recent years, Mr. J. H. Mitchell, Banana Inspector at Yandina, induced growers in his district to try out the system with such success that it has been generally adopted in some localities as the best way to increase the quantity and quality of Cavendish, Gros Michel, and Mons Marie varieties of bananas and get the best possible results out of any plantation. The system can be applied to Sugar and Lady Finger varieties with alterations in the number of suckers left and distance apart of the stools.

THE great problem facing the banana grower at the present juncture is the production of first-class fruit. In most instances the sites for banana growing have shifted from the extremely fertile scrub soils to forest soils of varying fertility and aspect. The necessity of grubbing the forest soil and the use of fertilizers has considerably increased the cost of production, and unless a definite system of desuckering is carried out the production from this class of soil will not often be commercially profitable.

A system of desuckering, which has been tried and proved in the Eumundi and Yandina district area and is locally known as the one-bunch one-sucker system, has as adherents the principal growers. Growers who have carried out the system have had as much as 200 cases to the acre for the first cut off forest soil, and by the selection of the correct follower for the second and subsequent cuts have reached an average of 500 cases per acre during the life of the plantation.

The system really starts with the selection of the stock for planting, and in this connection well developed eyes with a portion of the corm adhering, and known as bits, are given first preference, and small healthy suckers of approximately 3 inches diameter are next best.

The bits or suckers are planted in a hole to a depth of 6 inches below the ground level of the sucker. It is advisable not to fill the hole more than three inches at the time of planting, thus preventing the corm from forming too near the surface. The distance apart should not be less than 10 feet x 10 feet.

Suckers seem to be the most popular form of stock used, and in placing these in the holes the followers for the second and succeeding crops can in a big percentage of cases be definitely ascertained. The side of the sucker furthest away from the parent usually produces the correct follower, and the sucker should be placed with the correct side facing the direction from which it is desired the follower should grow. (See Plate 144.) The usual method is to have the follower occur on the

PLATE 144.

"A"—also indicated by the arrow—shows the correct sucker well down which should be left to produce the follower. "B" is a "sitter" formed about ground level and should be destroyed.

"C" shows a sucker ready to be detached from the parent corm for planting. If the top is always severed with a sloping cut as shown, and the sucker planted with the lower point of the cut "D" facing up hill, the follower is nearly always certain to grow in the right position, shown approximately at "E."

top side, but on very steep slopes a follower at the side is preferred for the reason that if left directly behind, the old corm when rotting allows the young plant to sag forward, whereas if on the side the ground helps to stay it. The maiden plant must be regularly desuckered *as soon as the suckers appear above the ground*, this operation being most important, having, as it does, a direct influence on the size and quality of the expected bunch.

PLATE 145.

Shows the parent plant "A" with a matured bunch and a suker "B" of the correct size and in the correct position at the side for the following season.

Where a grower has had experience in a certain locality, the number of months required to throw a bunch can in most cases be used as a basis in determining the time when the follower is allowed to come. From observations of quite a number of seasons and other factors in north coast districts, it is believed a period of fourteen months is the usual time it takes from planting to bunching. Using this with local data, followers can be left to insure the avoidance of fruit being thrown during November, as such fruit, having been formed in the winter, is usually unprofitable.

The most important factor governing the system is the selection of the correct first follower, and although some seasons make it somewhat hard, a careful observant grower can get at least 95 per cent. correct. On examining a banana plant with a number of suckers surrounding the butt, it will be found that the majority, and in some cases the whole, of the suckers are growing from eyes or buds that are in a circle at or near the soil level. These suckers are referred to as "sitters," and when allowed to develop into matured plants are sitting more or less on the surface with a root action that is superficial. *Such suckers are to be avoided as followers.*

Plate 146.

Shows the third generation of plants. "A" is the original plant from which a bunch has been cut, "B" is the first follower ready to bunch the second season, and "C" is the follower for the third season. Note that "C" is in a direct line away from "A."

Usually after the plant has made good growth and has been regularly desuckered, it forms one or perhaps more suckers that come from buds or eyes directly *below* the top layer of eyes and at least 5

inches lower in the soil: *these are the correct followers,* and if the injunction to place the suckers the correct way when planting has been carried out, by the time the bunch is thrown on the parent plant the grower will have a nice sturdy spear-leaved follower of from 2 to 4 feet in height on the top of the side according to the contour of the plantation. It is of the utmost importance that the follower is above ground *when the bunch is thrown on the parent plant.*

Once a grower has reached the stage of having his next year's follower correctly placed as regards position and time his main troubles are over, as it has been proved definitely that the third and succeeding correct followers, to the extent of 95 per cent., are true follows through, *i.e.,* in a direct line with the original plant and the first follower. (See Plate 146.) The straight follow-through demands that the planter must ensure that the first follower does not grow on the down hill side or towards a fixed object such as a stump or a stone.

The objectives of this system are the same as are aimed for in every other line of fruit production where pruning is resorted to for definite results. A desuckered banana plant enjoys a maximum of sunlight, available food and moisture, and must, when these and other essential factors are present, produce a superior article. In addition, a one-bunch one-sucker plantation can be regularly and effectively baited for beetle and offers every facility for inspection for bunchy top and other diseases.

The one big idea that a grower has to keep in mind is that suckers other than those required only absorb plant food out of his bearing plants and his bank book as well, so his slogan must be—Desucker, Desucker, Desucker!

PACKING BANANAS FOR MARKET.

By JAS. H. GREGORY, Instructor in Fruit Packing.

OWING to the great distances bananas have to be transported to various markets, and to the various kinds of weather conditions that are experienced during transport, many difficulties are encountered by those engaged in trying to build on a firm basis a banana trade of Australian-grown bananas. With the opening of the Kyogle Railway these difficulties were somewhat reduced through the elimination of the intensely cold journey over the New England Highlands being replaced by the more even temperatures of the coastal route. Between Sydney and Melbourne the same difficulties of extremes of heat and cold still exist, particularly the heat of summer, which causes much "boiling" of fruit at that time of the year. As science and better transport facilities are playing their parts in gradually overcoming transport and ripening difficulties, it is necessary for the growers to do their share.

Unfortunately, bananas are grown in many unsuitable places which do not always yield the best type of fruit for ripening into the luscious and healthful fruit the banana should be. We also find that many growers after producing good fruit do not always harvest and pack it to the best advantage. The publication of this article, besides showing the different methods recommended for use to ensure profitable marketing, is an appeal to all growers to endeavour to do the things necessary to show that we have nothing to fear from comparison when it comes to producing first-quality fruit.

In these days of intense and extensive competition, it is not profitable to produce or attempt to market any but first-quality fruit that will ripen fit to be eaten by the youngest child. Hard, "soapy," indigestible fruit will soon turn consumers to other fruits, with loss to the banana industry. The old axiom, "The Consumer is Always Right," still stands as the basic law of marketing.

MARKET CONDITIONS.

Bananas are at present packed by many individual growers, each grower adopting his own particular methods. As the plantations are not of a permanent nature, such as citrus or apple orchards, growers do not go to the trouble of putting up elaborate sheds and packing plants. Central packing-house or community systems could be used with advantage if a sufficient number of growers with co-operative spirit joined together to operate. Systems of this kind permit the advantages of a standard brand and product to be obtained, ensuring increased regular supplies, which is an advantage in creating stabilised marketing from both the distributor's and retailer's point of view. Another disadvantage of the present system is the great number of ripeners, each using his own system of ripening, some giving good results and some leaving much to be desired. This is gradually being overcome in the larger centres by the adoption of centralised methods.

At the present time the most extensively-used case, which contains 1½ bushels, leaves much to be desired from the retailer's point of view. A case containing 1 bushel has been evolved, and it is hoped that all sections will endeavour to assist in making the smaller case popular. All users of the smaller case have expressed the opinion that it will fill a long-felt want. It must be remembered that when making a change of any description in marketing methods, opposition will be met with in some directions due to small personal interests which forget the big principles of the industry at stake.

The main difficulty encountered on the markets to-day is not an over-supply of good fruit, but rather the over-marketing of too much poor-grade fruit, which is hard to shift, and creates an over-supply. If a steady and standardised output of bananas in grade and quality could be obtained, many of our troubles would disappear. These results would not be hard to achieve if all growers produced crops of the same quality and handled and marketed them in the same way. Unfortunately, owing to the individual opinions on grade standards and methods of growing that exist, there is a great barrier to surmount, and it will only be by the efforts of all in the industry working together that stabilised marketing will be created. Many growers send to market fruit of poor quality which they would never permit their families to buy for their own household supplies if they had to buy bananas, yet at the same time they feel they have profited if they can get fruit of this description on the market. They do not realise that the wholesaler will have difficulty in disposing of fruit of this kind, and that the retailer will probably lose on it. Poor types of fruit are often bought at a low price by barrowmen or hawkers who sell at a cheap rate. These cheap prices, both wholesale and retail, have a great tendency to lower the trend of market prices to the disadvantage of the better grades. It costs more to market small low-grade fruit, and any growers who send this fruit to market in order to, as they say, pay expenses,

must lose in the long run by a reduction in price of the fruit which more than pays expenses. Generally a closer application to cultural methods and the selection of suitable sites for growing will overcome largely the production of small low-grade fruit. Housewives buying low-grade fruit soon tire of that particular fruit and turn to something else, with a consequent decrease in the demand for the former. If retailers, when buying on a particular grade marking, find it unsatisfactory they promptly turn to another brand. Under these conditions a grower might possibly get a fair price for his first consignments, but it will not be long before prices below market values for good fruit will have to be accepted. It would seem reasonable that agents would refuse to handle inferior lines of fruit, but unfortunately owing to competition and lack of co-operation amongst themselves, they are unable to bring about reforms which they know would be desirable.

Before embarking on banana production, growers should have enough capital to properly equip the plantation. The following are necessities for easy handling:—

Economical wiring systems for bringing fruit from the plantation to the packing shed.

A suitable packing-shed, with benches and sorting tables.

A casemaking bench, hammers, a long, narrow-bladed dehanding knife, cane-knives for removing bunches from the stool.

Yokes to enable bunches to be carried to the wire-heads, stencils, brushes, and inking equipment.

These matters will all be dealt with as we go along, and as far as possible will be illustrated and described.

PREPARING TO CUT.

Before cutting growers should give careful consideration to the maturity of the fruit. Judgment must be exercised in selecting bunches at the right stage of maturity. It is difficult to lay down any set rules to govern maturity, as climatic conditions, location and cultivation all have a bearing on the particular type of fruit that can be produced. Conditions and type of fruit vary in different districts. As far as possible growers should cut well-filled fruit, avoiding the thin angular type. Sometimes, after a prolonged dry spell, fruit matures whilst still angular in shape. Bunches of this type often show they are ready to pick by the splitting of some of the fruit at the top of the bunch. More latitude to the extent of a few extra days can be given for the fruit to mature in winter, as during the cold weather there is not the same danger of fruit ripening in transit as during the hot summer months. Growers should take care to always shield the fruit from the risk of burning or bleaching by the direct rays of the sun; this can be done by bending a leaf near the bunch to lie over the fruit for protection from the sun. This also assists in allowing the fruit at the back of the bunch, which is sometimes backward in development, to develop the same condition as the more exposed front fruit.

HANDLING BEFORE PACKING.

Care in all handling operations, right up to the time the lid is placed on the case, must be stressed as it is during the period from cutting to packing that the risk of damage is greatest. The banana,

as with other fruits, must be handled so that no skin damage, squeezing, bruising, &c., takes place. Injuries of this description are the points of entry for transit and ripening rots, such as black-end, squirter &c.

REMOVING THE BUNCH.

When cutting the bunch from the stool, care should be taken to keep, as far as possible, the bunch from coming in contact with anything which will bend the fruit in any way. With large bunches it is often advisable for two operators to assist in removing the bunch, one to cut the bunch whilst the other supports the weight and lowers it gently to the ground. Bunches should be kept, as far as possible, in a vertical position. A cane-knife is a useful tool for removing the bunch from the stool. Where the bunches have to be carried by hand a yoke is a useful adjunct for use, the bunches whilst being carried in this manner getting the maximum protection. Bunches should at no time be placed in a horizontal position one upon the other; individual fruits, on being pressed or twisted from their natural positions on the bunch, are bruised at the shank. This is often the start of black-end. Growers can observe this bruising taking place for themselves. Bend the shank of a banana slightly and notice the darkening or "flushing" that takes place under the skin of the shank. Unfortunately, when the pressure is released the bruising practically disappears, although the damage has been done and the development of black-end started. Growers are often observed carrying bunches on their shoulders, and also stacking them on their sides on top of each other. This is possibly a great cause of the production of black-end which no amount of care in packing could eliminate. Good overhead wiring systems, placed in the plantation in position to minimise as much as possible the necessity for carrying bunches far by hand, give great assistance in eliminating damage to the stalk ends of fruit. The wiring systems should be so placed and designed that it is impossible for the bunches to be jolted or touched by anything whatsoever whilst they are attached to the pulleys and running to the packing shed. The use of a yoke permits two bunches to be carried to the wirehead or packing shed at the same time.

Summarised, the following recommendations are important when handling before packing:—

1. Select only matured fruit;
2. Take every care to avoid bending the shanks of the bananas when removing the bunch from the plant and transporting it to the packing shed.
3. Keep bunches in a vertical position as far as possible.
4. Select only good case timber with thick sides to give maximum protection in transit.
5. In summer keep the fruit as cool as possible when harvesting and transporting from the plantation to the rail. In winter keep the fruit from becoming chilled by protecting from cold winds, &c.
6. Clean the fruit of all foreign and decayed matter caused by animals, insects, or otherwise.

THE PACKING SHED.

This should be situated on that part of the plantation nearest to the best road for carrying out. The erection and placing of the wiring systems will also have a great influence on this. As banana-growing is not permanently carried out on the same land, as with other fruit, sheds of a temporary nature are usually erected. The shed, without being too large, should have ample room for easy handling of the largest quantity likely to be put through. Provision should be made for space for benches for placing the bunches on to cool and sweat before dehanding, a case-making bench, and a room for case timber, and made up cases. A diagram (Plate 147, Packing House Layout) shows the method of planning a satisfactory shed.

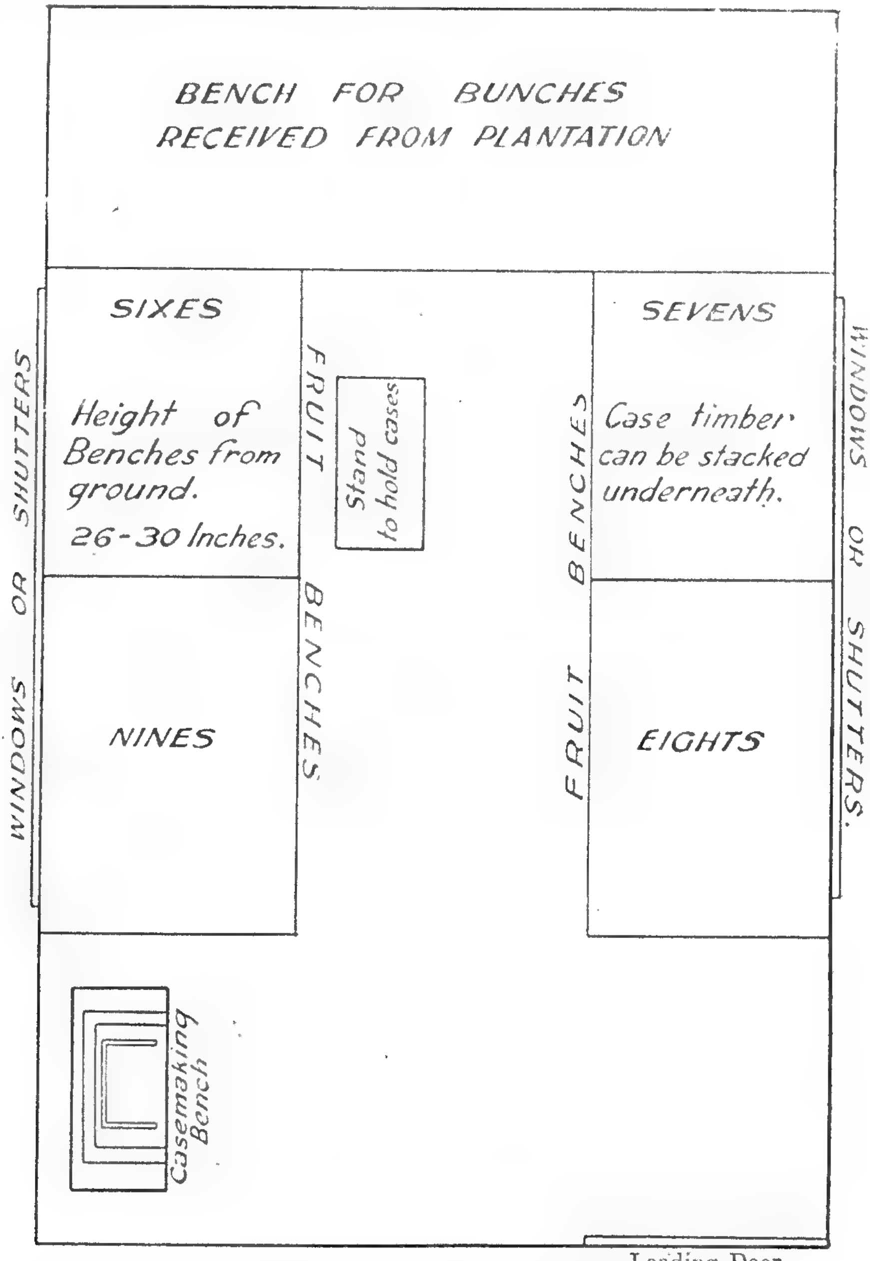


Plate 147.
SUGGESTED LAYOUT OF A BANANA PACKING SHED.

This can be altered to suit any plantation. A shed of this type can be operated systematically, eliminating much work. The fruit is received at one end and stacked upright one bunch high, in order to cool. As the bunches are dehanded the hands are placed according to their approximate sizes on to flat-topped benches, "sixes," "sevens," "eights," or "nines," as the case may be, being separated. Time will be saved if the sizes which comprise the bulk of the shipment are handed off on to the benches nearest the heap of bunches. The packer then packs one size, and if fruit of one of the other sizes is found mixed in,

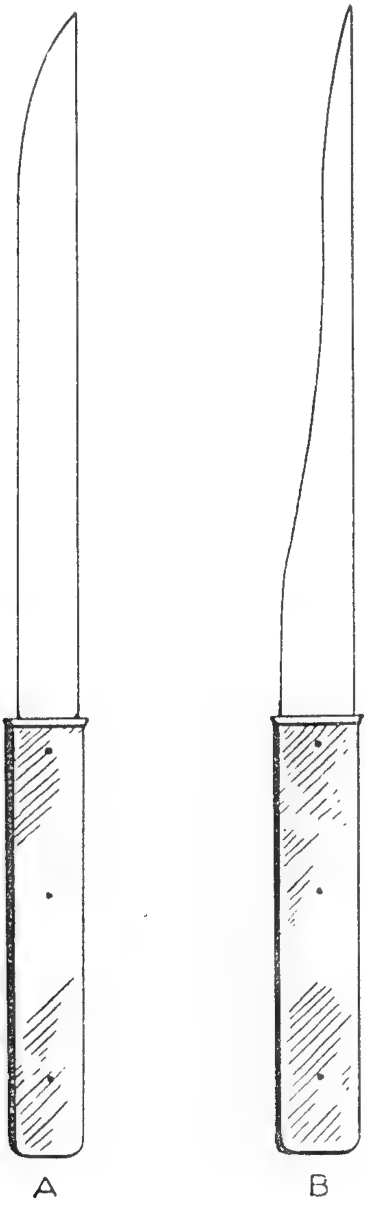


Plate 148.

A. Unsuitable knife for de-handing.

B. Suitable knife, with thin blade making it easy to make the semi-circular cut necessary.

it is transferred to the bench holding that particular size. It is recommended to pack the largest sizes first, working back to the smallest. An alternate method is to pack two cases of the one grade at a time, large and small, to avoid the double handling mentioned.

PACKING HOUSE EQUIPMENT.

De-handing Knife.

Along with a well-designed packing shed, good equipment should be installed. A good dehanding knife is an essential tool. Much time will be saved with this tool. A long tapered sharp blade is ideal, permitting the operator to make the semi-circular cut with ease. Wide-ended blades of the carving knife pattern are slow and unsatisfactory.

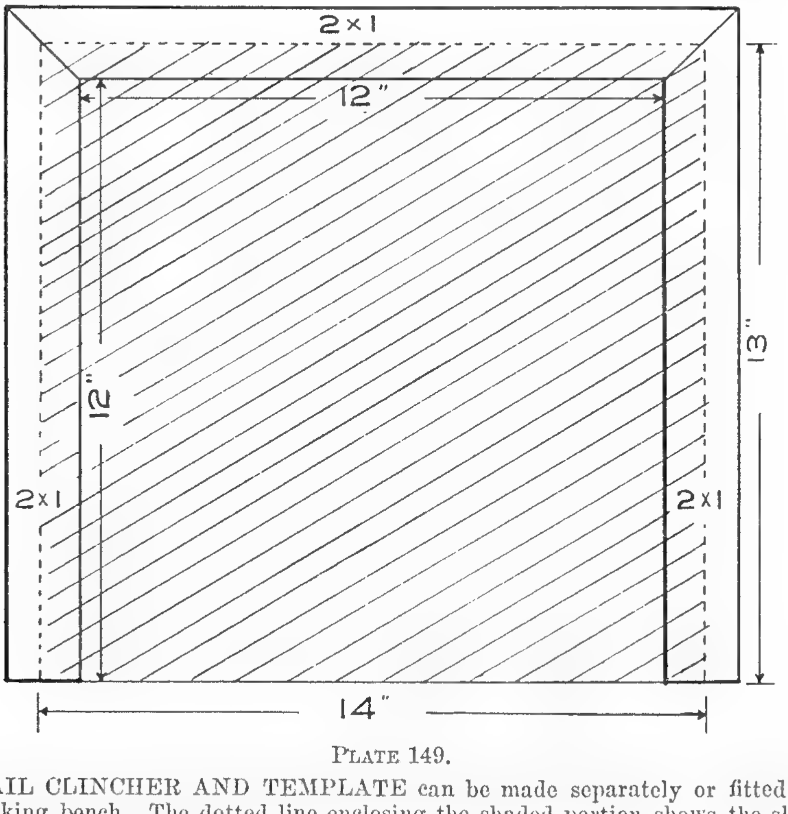


Plate 149.

NAIL CLINCHER AND TEMPLATE can be made separately or fitted to the case-making bench. The dotted line enclosing the shaded portion shows the shape of the piece of sheet iron.

The materials required are—

2 pieces wood 2 inches x 1 inch, 14 inches long;
1 piece wood 2 inches x 1 inch, 16 inches long;
1 piece sheet iron 14 inches x 13 inches x $\frac{1}{8}$ inch;
and necessary nails.

Stencils.

Stencils are the means of placing a good finish to the packed case of fruit. The marketing regulations insist that the grower's name and full address be placed on the end of the case in letters not less than one-half-inch in height. The following stencils are needed:—Grower's stencil, with name and full address; stencil showing variety, such as

"Cavendish," and sizes, "Sixes," "Sevens," "Eights" or "Nines." Agents will generally supply the necessary stencils for shipping brands free on application.

Hammers and nail boxes are necessary.

Case lidding presses are extremely useful. There are many home-made ones to be seen which are quite satisfactory.

A properly made stencil-ink tin is a small moneysaver, as well as helping to do a better job. A flat tin filled with a handful of engineer's cotton waste, kept saturated with water and used in conjunction with the cake of stencil ink, is easily procured or made from a kerosene tin. Stencil ink used this way lasts longer, as well as giving a cleaner stencil print.

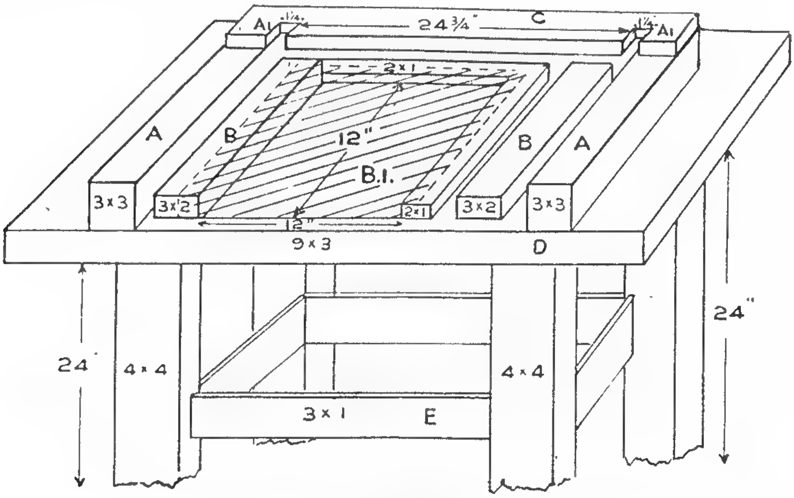


Plate 150.

BANANA CASE-MAKING BENCH, SHOWING METHOD OF ATTACHING CASE END, TEMPLATE AND NAIL CLINCHER.

SPECIFICATIONS:

Length:—42-50 inches;
Height:—(Underside of top), 24 inches;
Width:—24 inches;
Template:—As described (Plate 149);
Timber:—Legs, 4 inches x 4 inches;
Stops:—(A) Outside, 3 inches x 3 inches x 13½ inches;
(B) Inside, 3 inches x 2 inches x 12 inches;
(C) Back, 3 inches x 1 inch x 34 inches;
Top:—(D) 3 pieces 8 inches x 3 inches x desired length;
Stays:—(E) 3 inches x 1 inch.

DESCRIPTION:

The stops (A) and (B) are placed approximately 1½ inches apart, with the back stop (C placed across the back ends of (A) and (B). A cut 1 inch deep and 1½ inches wide is made in the back stop to correspond with the slot between (A) and (B). The back end of this cut should be 12 inches from the front of the bench. The inside stop (B) is placed ½ inch from the front edge.

Template and Nail Clincher.

Many growers find difficulty in making up two-piece ends for fruit cases into correct widths owing, often, to the badly-cut timber. This

can be easily overcome by attaching a template, in the form of a three-sided wooden frame, to the shed bench. A piece of flat sheet iron is placed to cover the space enclosed by the sides of the template. This acts as a nail clincher, turning the ends of the nails when the cleats used for joining the two pieces making the end are hammered on.

If a case-making bench is used the template can be attached as part of the bench, as shown in the illustration, the shaded portion representing the flat sheet iron. When the template is made up in combination with the casemaking bench it is only necessary to provide pieces of timber for two sides, the third side being made up by using the inside stop piece (B, Plate 150) of the bench top.

Case Making Bench.

The cost of timber is very little to make a first-class case-making bench. Some growers have found the use of an old stump excellent, placing the timber-holding portions on the stump. Where the bench illustrated is used, care should be taken to place the slots to hold the ends immediately above the legs of the bench. This permits the full force of the hammer blow to be utilised. The illustration (Plate 150) shows the bench made with template attached for making two-piece ends square.

BANANA CASES.

It never pays to buy second-grade cases. When used for distant markets the banana case has to stand up to very rough usage, mainly owing to its excessive weight when packed. Good timber free from knots should be chosen for lids and bottoms, as these have to bend and stand up to any strain caused through packing the fruit with a bulge. Ends are usually made up of two pieces and joined together by two cleats. Ends should be of a minimum thickness of three-quarters ($\frac{3}{4}$) of an inch, and where cleats are used these should be approximately two (2) inches wide by three-eights ($\frac{3}{8}$) of an inch thick. To prevent the timber of the ends and cleats from splitting when the lids are nailed on, care should be taken when nailing the two pieces together with cleats to space the nails correctly (see Plate 151) and place them as shown.

It is recommended to nail on the lids and bottoms across the grain as shown, but if care is not taken to nail the cleats correctly it is quite possible with some timbers for the pressure of the lid, if the case is packed with a high bulge, to break away a part of the end. If $1\frac{3}{4}$ inch nails are used and the top and bottom nails through the cleats are placed three-quarters of an inch ($\frac{3}{4}$ inch) from the cleat ends on the inside edge, it will be almost impossible for this trouble to occur. Owing to the occurrence of this trouble many growers prefer to drive the nails in end grain. Whilst with some timbers, provided the nails are driven on the skew, no apparent weakness is shown, it is recommended that driving the nails across the grain is the most fool-proof method of nailing down for all timbers. It is strongly recommended that all nails be of a minimum length of $1\frac{3}{4}$ inches and of 14 gauge. Using smaller nails is false economy, and leads to trouble with breakages and ullages during transit. Rusting the nails assists in making them hold better; a large pinch of salt thrown amongst the nails will soon rust them. The wiring of packed cases is strongly recommended for long-distance transit.

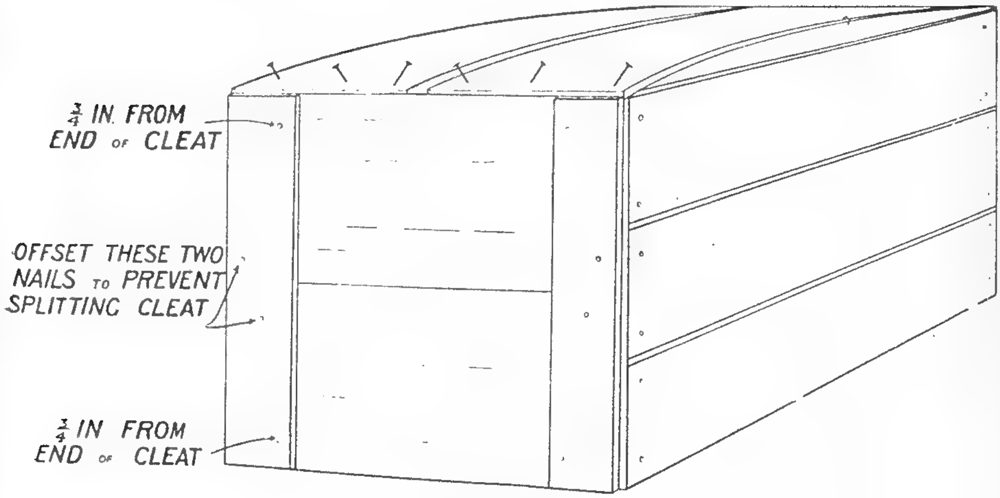


Plate 151.

METHOD OF MAKING A BANANA CASE AND NAILING DOWN.

NOTE.—The direction in which the nails for the lid are driven.

DE-HANDING.

Much time and trouble can be saved if a little thought and attention is given when de-handing. The hand should be removed from the stalk by cutting around the stem through the flange joining the fruit to the stem. A careful examination will show the different sections that make up the full hand. (Plate 152.) The hand illustrated is quite a typical example, although variations in the actual composition of a hand occur according to the part of the bunch from which the hand is removed.

To remove the fruit from the bunch a cut is made through the flange or joining-piece along the raised brown ridge (4). Occasionally a slight variation in the placing of this cut may have to be made owing to some hands differing slightly in the way they are attached to the stalk. Notwithstanding any slight difference as mentioned, the cut should always be made at least a quarter of an inch from the girdle (3) around the shank of the fruit, leaving a small piece of the wood attached to the shank. (Plate 153.) It may be necessary with awkwardly-shaped bunches to avoid damage to adjoining hands to make two cuts, one to remove the hand, and a second to trim away any surplus wood before breaking for packing. Hands removed from the bunch in this manner will easily break into part hands or singles, leaving a small length of the corky wood attached at the end of the shank to dry out. This assists in protecting the fruit from black-end, squirter, and other infections, also leaving the shank full and well-shapen.

The following faults may occur in hand-cutting:—Cutting the hand from the stalk and leaving too much wood on the hand makes it difficult to break the fruit from the hand. This may cause the shanks or stalks to become wrenched, and, in some cases, torn. (Plate 154.)

PLATE 152.
A FULL HAND OF BANANAS CUT IN SECTION THROUGH THE STALK OF THE BUNCH.

1. The fruit;
2. The shank or neck of the banana;
3. The raised girdle around the neck of the banana where the fruit is joined to the flange;
4. The raised brown ridge running round the flange or piece joining the fruit to the stalk;
5. The joining-piece or flange;
6. Cross-section of the bunch stalk.

Plate 153.

HAND REMOVED FROM THE BUNCH.—Note the absence of excess wood. If in doubt it is better to leave too much wood, as a second cut can always complete the operation.

Leaving too little wood, so that part of the stalk is removed when de-handing causes a shrivelling of the shank end, and often during the ripening process these shrivelled ends show signs of premature rotting. (Plate 155.)

A B

Plate 154.

BANANAS REMOVED FROM THE HAND SHOWING AN EXCESS OF WOOD LEFT ON THE END.

A.—Showing excess wood.

B.—Torn shank, which often occurs through leaving excess wood.

PLATE 155.
Banana showing shrivelled shank end caused by removing too much wood.

This type of fruit is the cause of much dissatisfaction to ripeners, retailers and consumers. The value of the fruit from the point of view of display is spoilt to both ripener and retailer. Fruit of this description also appears smaller than it would otherwise. The consumer gathers the impression that the fruit is starting to decay, which makes it an unappetising commodity for table purposes. These troubles and

Plate 156.
Method of holding the hand of bananas for breaking.

Plate 157.
Breaking bananas from the hand. Note how the fruit is held by the shank.

faults can all be overcome by care in cutting and the use of a good de-handing knife. A good de-handing knife is a necessity for fast, efficient work. Compare the types of knives shown in Plate 148. The long thin knife (B) makes it possible to make the semi-circular cut comparatively easily and quickly. Sharpness of the knife is essential.

Breaking the Hands.

Breaking the hands into part hands or singles will present no difficulties if the de-handing has been carried out correctly. The easiest method of breaking is to support the full hand along the arm with the hand spread beneath one end and the other end resting on the wrist and forearm.

The fruit is then broken from the hand by being gripped firmly by the shank (Plate 157) and broken off by the use of a semi-circular motion. On no account should fruit be pulled or wrenched from the hand.

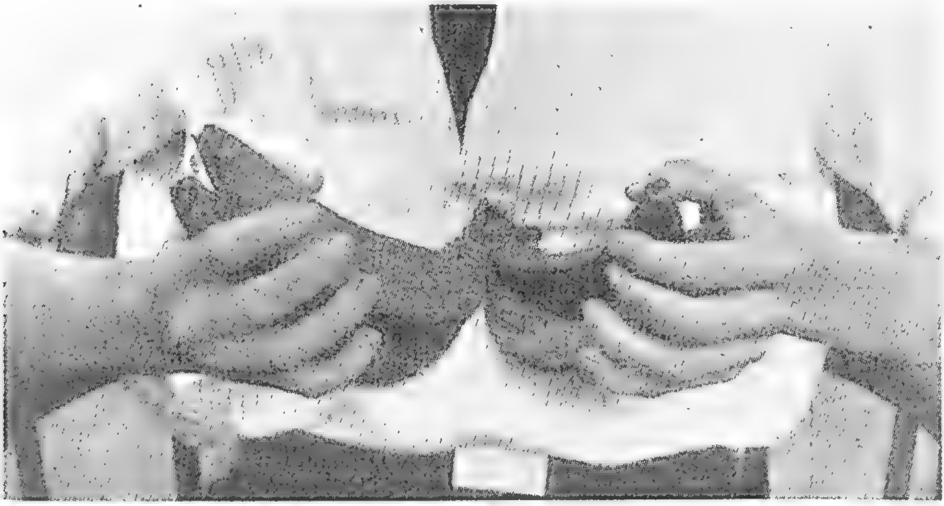


Plate 158.
Wrong method of breaking hands.

Handling by the shank only, so far as the shape of the bunch will allow, is of the utmost importance. Some operators hold the hands by the flower end of the bananas when breaking (Plate 158). This must cause damage to the fruit and increase the possibility of transit and ripening troubles. Cutting the hands into singles or part hands is to be recommended, but it is doubtful whether most growers would consider it an economical proposition to do this when banana prices are low. Cutting gives an excellent appearance to the fruit after ripening. An example of a well-broken and cut banana is shown in Plate 159.

To summarise the foregoing, the following points should be stressed when dehanding and breaking hands:—

- Procure a satisfactory dehanding knife.
- When removing from the bunch do not leave too much or too little wood attached to the hand.

Plate 159.

A.—A well-removed single banana. Note the amount of wood adhering to the end of the shank.

B.—Example of fruit cut from the hand.

Make two cuts if necessary. It is better to do this than to take too much off with the first cut.

When breaking hands, take care to handle the fruit by the shank end.

Support the "hand" of fruit on the arm so that no strain is placed on any individual fruit.

Care and cleanliness should be exercised in order to eliminate chances of fungal infections which bring Squirter and Black-end.

[To be continued.]

ASPARAGUS GROWING.

By H. Barnes, Director of Fruit Culture.

ORCHARDISTS and small crop growers who are looking for something new to grow might well devote an area of land to the production of Asparagus. There is a definite demand for considerable quantities from both the fresh vegetable market and the canneries. Queensland conditions are suited to its growth, and there is no reason why we should not eventually produce sufficient to develop an export trade in this excellent vegetable product; at present we import large quantities. Growers in New South Wales have wakened up to the possibilities, and now quite a lot of asparagus is grown in that State, and a canning factory for treating that which is not required as a fresh product has been erected at Bathurst.

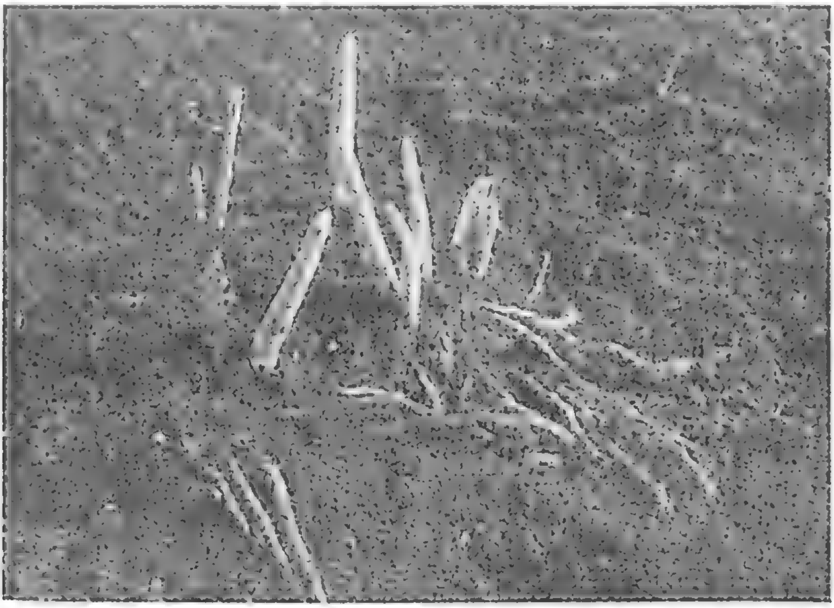


Plate 160.
Asparagus Stems Ready for Cutting.

The asparagus tips of commerce are the edible shoots of the asparagus plant, a perennial thriving best in soils containing a large percentage of sand. The rich alluvial soils of river flats will produce asparagus of large size and good quality, and therefore their composition may be imitated in preparing other soils for the cultivation of this plant. Although asparagus can make use of large quantities of water when growing, it requires a well-drained soil. Stagnant water is fatal to the plant.

Propagation.

Seed should be sown in the spring in a well-prepared seedbed containing a large percentage of sand. Germination is slow, but it may be hastened by soaking the seeds in warm water for twenty-four hours prior to planting. When the seedlings are several inches high they should be thinned out to three to four inches apart, and the strongest left to grow.

Early the following spring, just prior to the new growth, the plants may be transplanted into the field, care being taken not to expose the roots to the sun or dry air. All weakly and shrubby plants must be discarded, and only the tall, strong plants with thick succulent stems planted out.

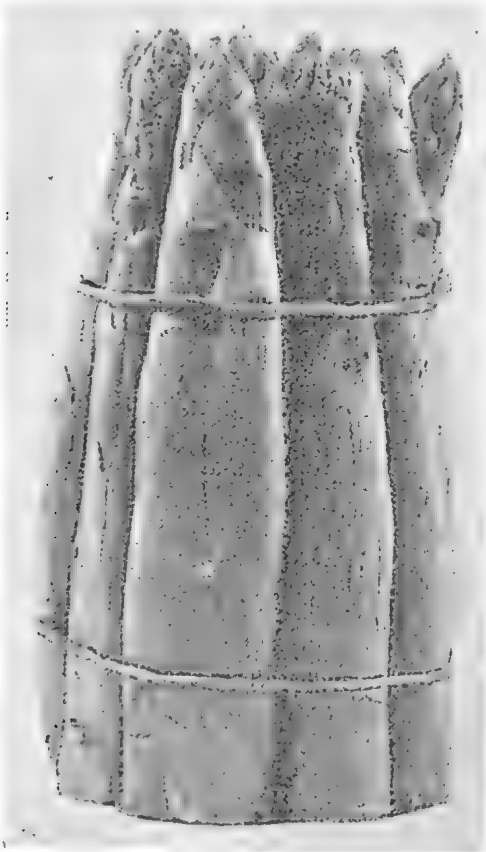


Plate 161.
Bunched Asparagus Tips.

Planting.

The root system of asparagus plants is extensive and vigorous, and therefore ample room must be allowed for development. Drills 9 in. deep with a slight ridge in the bottom should be opened not less than four feet apart, and the plants set out about 4 ft. apart in the drills. This will admit of horse cultivation being employed each way for the suppression of weeds. The ridge in the bottom of the drills will be of material assistance for spreading the roots of the crowns, which should then be covered with 2 to 3 in. of soil. If "blanched" asparagus tips are required, the crown should be covered with about 6 in. of soil; if "green" tips, the soil should be shallower.

Each year the growth of the crown forces it closer to the surface of the land, but if available animal manures are added annually the original depth can be maintained.

Cultivation.

After the plants have been set out the land should be kept well cultivated to keep down weed growth and to conserve moisture. If the weather is dry and irrigation is available, copious applications of water are advisable. During the autumn the plants will seed and turn brown. They should then be cut down about 6 in. above the ground, and the tops carted off and burned. During the winter the land should be well cultivated and more farm-yard manure applied. Early in the spring artificial fertilizers may be applied. The Agricultural Chemist recommends 2 cwt. nitrate of soda, 2½ cwt. bonedust, 2½ cwt. superphosphate, and 1 cwt. muriate of potash per acre.

During the second spring, after planting out, it is not advisable to harvest any tips; rather it is better to allow the plants to build up a strong constitution for the subsequent years and the grower may depend that his patience will be then well rewarded. During the autumn of the second year the plants should be cut down before they have seeded. Seed bearing is very exhausting to the plants and is also one of the chief sources of trouble in keeping the cultivation clean. The same cultural practice as outlined above should be adopted during the subsequent winters and early spring months.

Cutting.

During the third spring, after planting out, light cutting may commence. The tips should be cut before the scales on the heads have opened out. At first it would be wise for the grower to carefully scratch away a few inches of the soil in order to see where he is cutting the tips. They should be from 6 to 9 in. long. With practice all that will be necessary will be to insert the knife into the soil to sever the tips below the surface. A special knife with the cutting edge at the end is made for the purpose.

During the third year the cutting season may cover from four to six weeks, and the plants should then be allowed to grow again, the tops being cut down in the autumn before seeding. In subsequent years the cutting season can be extended to about ten weeks before the plants are allowed to run to stem and leaf.

Throughout the cutting season the field should be gone over and the shoots cut each day, preferably commencing very early in the morning. If "blanched asparagus" is required it should be cut when the tops show above the ground. This system naturally necessitates the crowns being well below the surface, and may necessitate ridging the soil in the rows. For "green asparagus" the shoots are cut when they are about 7 in. high, cutting about 2 in. below the surface.

When cut the stalks should not be exposed too much to the sun. They should be washed in clean water, and if they are to be kept overnight they should be stood on end on wet straw or clean hessian in the shade. Prior to being tied into bundles of about twelve stalks they should be graded for quality and appearance.

With care the asparagus plot will last for a minimum of twelve years.

Varieties.

Varieties recommended are Connovers Colossal and Palmetto. About 20,000 seeds weigh 1 lb.

SOME TROPICAL FRUITS.

2. THE CASHEW NUT.

By S. E. STEPHENS, Instructor in Fruit Culture.

ALTHOUGH very well known and popular in the market places of its native home, the Cashew is unheard of in the markets of Queensland; in fact, it is quite unknown to all but a very few people. Even trees of this peculiar fruit are very few in the Queensland tropics.

A native of tropical South America, it is related to the mango, and is known botanically as *Anacardium occidentalis.*

The habit of growth is frequently ungainly, trunk and branches being very crooked and twisted. The foliage is clustered towards the ends of the stiff branchlets, the leaf being broad, oblong-oval, with rounded or emarginate apex. The flowers are produced in terminal panicles.

The fruit is peculiar in that it appears to carry its seed externally as an appendage at the lower end. In reality, the upper fleshy portion is the swollen peduncle and disc. The fruit proper is the seed or nut suspended from this.

The fleshy portion, called the Cashew apple to distinguish it from the true fruit or "Cashew nut," is commonly used for food purposes in its native Brazil. With its distinctive aroma it is said to make a pleasing jam, and is also largely used for making wine and a species of beverage similar to lemonade. The edible varieties of the Cashew apple are bright yellow or brilliant red in colour when ripe, thin skinned, juicy, and astringent.

The Cashew nut is a regular article of commerce, and is imported into European countries in fairly large quantities. It is a kidney-shaped nut about an inch in length and protected by a tough husk or shell, possessing caustic properties due to the presence of cardol and anacardic acid. Fortunately these substances are easily dispelled by heat. The nuts are, therefore, subjected to roasting, which renders them perfectly innocuous. The resultant product is a fine edible nut.

The Cashew is a simple tree to grow, but is one that dislikes being transplanted. The usual mode of establishing trees is to plant the fresh seed in the situation the tree is to occupy. The seed germinates readily within a few days, and the young trees make rapid growth both above and below ground. In young trees the tap root is often more extensive than the aerial growth, but lateral feeding roots are often deficient.

Growth is rapid for several years, and under favourable conditions the tree will start bearing at about three years, the crop being ripened during the summer months.

The tree is usually regarded as being fairly short-lived, surviving for only fifteen to twenty years, when it gums excessively and dies out. In North Queensland, however, several trees up to about twenty-five years old are still vigorous, and fruit well when seasonal conditions are favourable.

In regard to soil requirements, the Cashew is not particular, but its preference is for a sandy soil. It is intolerant of frost and does best under fairly dry climatic conditions, consequently its cultivation must be restricted to the drier parts of the tropics.

Well known allied species native to Queensland are the Burdekin plum (*Pleiogynium solandri*) and the Tar tree (*Semecarpus australiensis*). The former of these produces an edible fruit with a large stone, and is popular with school children. The latter exudes a black tar-like substance from both the bark and the fruit, which may cause a great deal of pain if it comes in contact with the skin.

VITICULTURE.

NOTES ON SUMMER PRUNING.

W. J. ROSS, Senior Instructor in Fruit Culture.

WITH the advent of the growing and fruiting season, summer pruning will engage attention in every well-conducted vineyard. Small-scale growers, i.e., those cultivating a few vines for household requirements, will be well repaid by giving the matter their careful attention also. Under normal conditions the degree of success attained will depend upon the amount of care exercised in performing this work.

Summer pruning, of which there are a number of forms, consists of the removal of buds, shoots, or leaves whilst they are green, and is performed after the vines have commenced growth in spring. Summer pruning is best performed early in the growing season before the vines have made too much growth, so that the operation causes the least possible injury to the plants. The leaves are intimately connected with the assimilation of food material for the use of the plants, consequently if summer pruning is left until late in the season and it then becomes necessary to remove well-grown canes, the vines not only lose the energy expended in the development of such canes, but lose also the assistance of the food material which would have been made available by the foliage destroyed, thereby having a weakening effect on the vines. Whereas winter pruning is carried on when the vines have been defoliated, and the operation has the effect of strengthening the plants, late summer pruning has the effect of weakening them. For this reason, disbudding should be attended to early in the spring before the shoots have made very much growth.

The early removal of growing shoots or parts of shoots causes a concentration of the growth in the parts allowed to remain. This concentrating effect and the weakening effect occur in inverse ratio and vary according to the time and method of operation. For instance, if the operation is carried out in early spring when the shoots have started growth, the weakening effect is very slight, and the concentrating effect is almost as marked as that of winter pruning, but if done when the vines are in full growth, the weakening effect may be sufficient to completely neutralise the concentrating effect—i.e., the removal of some of the canes may weaken the vine so much as to cause a halt in the growth

of those canes which are left. Still later in the season the weakening effect may exceed the concentrating effect and the canes left will, in this case, make less growth than if no canes had been removed.

The objects of summer pruning are briefly—

(1.) To direct growth into the most useful channels by disbudding and the removal of unwanted shoots, including suckers and water sprouts.

(2.) To moderate vigour and increase bearing and the size of the fruit (though usually at the expense of sweetness) by means of pinching and topping.

(3.) To provide for the desired amount of shade for the bunches; to promote upright growth of shoots and laterals; and to decrease shade when necessary.

(4.) The removal of surface roots and the thinning of fruit may also be considered as forms of summer pruning.

As regards disbudding. This operation is practised on young vines during the second and third years of growth. It consists of removing the buds on the lower region of the stem or trunk of the vine in order to concentrate the growth on the shoots above, and to prevent the production of canes low down, which would have to be cut off eventually.

The removal of buds is advocated when they have grown an inch or so. In large vineyards earlier disbudding is not feasible, as many of the buds are still dormant after the first start into growth.

Removing these too early would in most cases necessitate the vines being gone over again later, and this is, of course, a matter of economic importance. The sooner these young unwanted growths are removed, however, the better, because if they are allowed to remain too long they draw too much upon the reserves of the vine. When dealing with very young vines, which have not yet formed a stem, disbudding consists in the removal of all buds except the one selected to carry on growth in a single cane which the following year will form the arm or trunk of the vine.

The thinning of shoots has the same object as that obtained by disbudding. It may be performed when the shoots have grown several inches. It is not to be preferred to early disbudding, as it weakens the vine more and the concentration of energy to desirable channels is correspondingly less. It is simpler than disbudding, and the vines only require to be gone over once. It is practised principally during the second year in connection with vines which have been cut back to two buds at the end of the first season's growth.

Topping Young Vines.

As a result of disbudding or thinning of shoots during the second year all the growth has been directed into a single shoot, and this shoot will grow with great vigour. When it has grown to about a foot or so above the height at which it is desired to develop the head or the trunk, it should be topped in order to effect a forced growth of laterals which are made use of at the next winter pruning as first spurs or for the establishment of permanent arms. If topping is not done, as is frequently the case among beginners, there may be very few buds on the cane, when it is mature, at the height at which it is desired to lay down an arm

or establish a crown. Also it will be difficult to find buds properly situated for the development of canes to produce the crop which the vine should yield the third year. During the third summer, the number of shoots will be small in comparison to the vigour of the young vine. They will grow rapidly and consequently will be very liable to be broken off by wind while tender and succulent. To guard against this, topping should be resorted to before they are too long. This will aid them to lignify their tissues and become tough enough to withstand the pressure of wind. Also, topping at this time helps to keep the shoots upright and assists to give the arms the proper direction for the following winter pruning.

All shoots which originate at or below the surface of the ground (suckers) must be removed. Neglect to do this results in diminished vigour of the whole of the above-ground portions of the vine. Suckers bear little or no fruit, and since they grow vigorously they appropriate the sap which should go towards the nourishment of the whole vine. Furthermore, they rob the vine to such an extent that they may cause its death eventually. Should it happen that the above-ground portion of a shaped vine succumbs, it may be rebuilt by cutting off the dead portions and allowing a vigorous sucker to grow. Grafted vines which have been seriously weakened by the prolonged growth of suckers will not recover, and are better replaced with a new vine. It is important that desuckering be done with the greatest care and thoroughness during the first four or five years, as by so doing a great deal of work will be avoided in later years. Very few suckers will grow from vines which have been properly tended in this respect during their early life, but if desuckering has been imperfectly done an abundant crop of underground shoots will appear every year. Like disbudding, desuckering should be done early in the season. If suckers are left till late in the season, or allowed to grow throughout the summer, they promote the formation of dormant buds and of tissue, which forms adventitious buds below ground. To only partially remove a sucker is worse than useless as the portion left attached to the vine forms an underground spur which will be a source of perennial trouble.

Whilst the removal of water sprouts (sterile shoots) is advisable when it is wished to prevent growth where it is not wanted, or to promote growth where the reverse is the case, it is a mistake to remove all sterile roots in every case on the theory that they are useless. With vigorous vines the foliage they produce helps to nourish the vine and improves its capability to produce fruit. They are useful also at times as renewal and replacing spurs, for which purpose they are very suitable on account of their vigour.

When large numbers of water sprouts appear, it may usually be taken as a sign that the full vigour of the vine is not being used for the production of the crop, and the remedy for this happening is a change of style in the winter pruning. The production of sterile roots on what should be fruit wood is frequently the result of some cultural error, such as excess of water, nitrogen or humus, or the vine might be making growth too late in autumn or producing excessive vigour. The removal of water sprouts is advisable if the vines are weak, as growth can then be concentrated in the fruiting shoots to enable them

to nourish their crops better. In such cases the sprouts should be removed early, before they have grown more than a few inches.. Otherwise, the vine will be further weakened and the trouble increased the following year. If, on the other hand, vines are excessively vigorous, reducing the foliage by late removal of water sprouts may provide a remedy, but it is preferable to utilise this vigour for crop production by a change in the winter pruning.

Water sprouts sometimes give trouble by growing through the bunches, making it impossible to gather the crop without injury, and where this is prevalent, it indicates that the vine has been trained to an unsuitable shape. This can be modified during the winter pruning by giving the vine a greater spread to permit the bunches to hang free.

Pinching consists of the removal of the growing tips of a shoot with thumb and finger. Its weakening effect is very slight, as no expanded leaves and a very small amount of material are sacrificed. Its effect is to toughen the shoots and render them more capable of withstanding the pressure of wind. Shoots that are pinched early in their growth usually produce a new growing tip from a lateral. Late pinching causes several strong laterals to grow. Pinching fruiting shoots just before flowering tends to make the fruit "set" better and also promotes the starting of other buds for the production of more bunches. By pinching can be obtained most of the objects gained by topping, and with a minimum weakening of the vine.

Topping consists of removing one, two, or more feet of the end of a growing shoot. Generally it is practised more in the cooler than in the warmer areas. If done early it has much the same effect as pinching. The later topping is done the more weakening it is to the vine, because more leaves are removed than if done early. Constant severe topping may have a serious effect on the vigour of even the strongest of vines. Generally speaking, topping tends to increase the size of grapes, and to decrease quality. It is sometimes an advantageous practice in the case of table grapes on vigorous vines provided it is not done too severely. It is not advised in the case of wine or sultana grapes on account of its tendency to decrease the sugar and flavour of the grapes. Both pinching and topping are practised with the object of protecting the fruit from sunburn by increasing shade, and in this respect pinching is to be preferred.

Thinning Fruit.

Excessive tightness of bunches is a defect when it comes to the matter of packing and the removal of defective berries. This can be remedied by thinning the bunch before the berries are one-third grown. It also increases the size of the remaining berries, helps ripening and tends to promote colouring. Furthermore, it dispenses with a lot of trimming of bunches at time of packing. Thinning is done by cutting out several of the side branchlets on the upper part of the bunch. The number of branchlets to be removed will depend upon how tight the unthinned bunches usually become. After a little practice thinning can be done very rapidly, as no great care is necessary in preserving the shape of the bunch. Bunches which appear irregular or one-sided

immediately after thinning will later round out and become regular before ripening. Grape-trimming scissors are the most useful for this work.

Removing Surface Roots.

Young vines in some soils show a disposition to throw out roots at or very close to the surface of the ground, and especially so where irrigation in summer is practised. If these are allowed to grow they will form main roots and are liable to injury in cultivation. During the early life of the vine, therefore, it is advisable to cut off any roots which originate near the surface of the ground. This can be done while desuckering is being carried out.

THINNING DECIDUOUS STONE FRUITS.

By H. ST. JOHN PRATT, Instructor in Fruit Culture.

THE thinning of the fruit crop is really an operation almost as necessary as pruning, but unfortunately comparatively few growers appear to realise its great importance—probably this is because they have never given it their serious thought.

Some growers are alive to its value, but many say it is too costly and doesn't pay. As a matter of fact, no grower can afford not to thin his crop these days when the public rightly demand value for their money, and will not accept any old rubbish a grower may case up.

Good fruit is easy to handle and sells itself, whereas on the other hand, inferior fruit gluts the market, reduces the price for the good fruit, and is almost always handled at a loss.

There are grade standards laid down by the Department of Agriculture for plums, but they specify the minimum sizes that can be marketed, and no grower could hope to make fruit growing pay if he were to take these standards as his objective. With stone fruit it should be borne in mind that it is the formation of the stone that puts the strain on the tree and uses up the mineral constituents of the soil. The pulp of the fruit is mostly water. If the case production of two plum trees when harvested amounted to, say, 4, 5 or 6 cases each, but with tree No. 1 the fruit was $\frac{3}{4}$ inch in diameter and with tree No. 2, through thinning, the fruit was $1\frac{1}{2}$ inch in diameter, it would appear that the fruit of No. 2 was twice the size of No. 1, and so there would be twice the number of stones produced by No. 1 tree as by No. 2. In reality there would be eight times as many. Few growers would care to accept this statement, but if they work it out they will find it is correct. I have taken the sizes as $\frac{3}{4}$ inch and $1\frac{1}{2}$ inch; reduce these figures to quarter inches and you will get three quarters and six quarters, take the cube of each—for it is the cubic content of the case you have to fill—and you will get $3 \times 3 \times 3 = 27$, and $6 \times 6 \times 6 = 216$. So the volume of the $1\frac{1}{2}$-inch plum would be eight times as great as the $\frac{3}{4}$-inch plum.

From the above it will be seen that thinning out, apart from producing a saleable product at a payable price, must prolong the commercial life of the tree; and remember, too, that most of the diseases of stone fruit trees can, in very many cases, be traced to a debilitated state caused through over bearing.

As regards the direct expense of thinning—this can be discounted quite a lot when you consider that it takes no longer to pick a large plum than a small one, and if you thinned out 50 per cent. of the crop, it would mean that half was picked at the beginning of the life of the fruit and the other half at maturity, but more cases would be filled and more money received from the thinned crop. Thinning should be commenced directly after the "early drop," this drop being caused by deficient fertilization—then it will be seen what quantity of fruit there is to deal with.

Obviously the thinnings should be completed before the stone has hardened, and, in many cases, if the crop is a heavy one, the trees should be gone over twice, and possibly three times if necessary. Plums and apricots should be spaced at least 2½ to 3 inches apart and peaches and nectarines from 4 to 6 inches, according to variety.

If thinning was regularly, systematically, and intelligently practised in the Granite Belt the result would be:—

(1) No gluts in stone fruits.
(2) Prices would be better.
(3) Trees would live longer.
(4) A far easier crop to handle.
(5) Far less fruit fly.

One of these points would make thinning worth while—the five of them surely make it an obvious necessity.

CITRUS NOTES.

By R. L. PREST, Instructor in Fruit Culture.

THE present period in the citrus orchard is a very busy one. For the trees, it is the most active period of food uptake, and continues until the set. With the increase in temperature and the possibilities of a dry period, the utmost attention should be paid to soil conditions, particularly to aeration and moisture conservation. Soils begin to warm and bacteria becomes more active, and where conditions are satisfactory the trees put on rapid growth. At the same time, care and forethought should be given to cultivation, as, in coastal areas, the possibilities of the approach of storms will call for the consideration of shallow drains to care for excess water and prevent erosion.

Pruning operations should have been completed. The reworking of unprofitable varieties may be continued. Where trees have been headed back, care should be taken to whitewash the limbs to prevent sunburn. A satisfactory wash may be prepared by slacking down 7 lb. of stone lime and adding 2 lb. of powdered sulphur and 1 lb. of salt. During the following months a limited number of growths is permitted, and budding is carried out in the autumn.

Where soil and climatic conditions are favourable, planting may be continued. In planting care should be taken to spread the roots so as to radiate outwards and downwards. The roots should be covered carefully with fine top soil, and firmly pressed down and watered, after which the rest of the soil may be filled in. In the late sectors Valencia Lates will require harvesting in order to avoid the ravages of fruitfly.

FRUIT MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

THE most noteworthy feature of the marketing of fruit during September has been the phenomenal rise in the price of mandarins. This goes to prove that the law of supply and demand still operates in so far as prices for fruit are concerned. This factor should be a feature to impress growers that it should be possible to organise marketing to a greater extent, with a view to maintaining regular supplies without oversupplying the market. It is also a travesty that the poorer-quality, end-of-season fruit should command much better prices than the first-grade, mid-season fruit. This applies to most of the fruits during the season. These features of marketing should give rise to much thought as to whether it would not be better to raise the minimum standards of fruit permitted on the market, thus giving a better return and protection to those growers who do endeavour to market fruit to the best advantage.

Apples.

It is time that all lines of apples held in cold storage were starting to be placed on the market. Prices are firm for Granny Smiths at 8s. to 13s. The holding of large fruit from now on is increasing the risk of loss.

Papaws.

Melbourne, 8s. to 10s.; Sydney, 7s. to 12s.; Brisbane, 1s. 6d. to 4s. 6d. per bushel. The warm weather is approaching, so care must be taken to select suitable fruit to carry to interstate markets; fruit which will arrive in Brisbane ripe, in Sydney well coloured, or in Melbourne partly coloured, should give good returns.

Pines.

The return from pines is almost on a par from all markets, Sydney 7s. to 9s. being perhaps the best. Melbourne prices were 7s. to 10s. per case; Brisbane, 4s. to 6s. 6d. Remember blady grass is not to be preferred to clean woodwool for packing. Blady grass generally opens, giving the case a musty odour.

Bananas.

Melbourne, 14s. to 15s. for "nines" and "eights," 12s. to 13s. for "sevens," 10s. to 11s. for "sixes"; Sydney 1s. per case better all round, excepting "nines," which touched 17s. to 18s. Now that the weather is warmer, care should be taken to keep the fruit cool during all stages of packing and handling.

Tomatoes.

Prices ranged, at Melbourne, up to 9s., coloured 10s.; Sydney, 7s. to 9s., special higher; Brisbane, green 4s. to 7s., ripe up to 8s., special ripe to 10s. Let us all work this year to improve on the excellent quality and maturity of last season. If the maturity is kept up, speculators will find it difficult to operate on the market to their own advantage. This will help to maintain more even prices.

Oranges.

The wet weather had an adverse effect on the market, oranges being slow of sale, 4s. to 10s. were the ruling prices, these prices being an indication of the difference in the quality of the supplies available.

Mandarins.

I have dealt with the main marketing aspects of this fruit. Prices were, for Glen Retreat, 5s. to 16s.; for King of Siam, 6s. to 10s. The prices of Glen Retreat show a wide difference in the quality available. Dry puffy fruit is always hard to move.

Lemons.

Slow of sale, with prices from 5s. to 8s., but the demand should improve with the advent of warm weather.

Grapefruit.

Prices ranged from 8s. to 13s. for good quality. Marsh Seedless still retain its popularity as the best grapefruit. The writer is at this time (late September) still enjoying some first-rate fruit of this variety, purchased at the Royal National Exhibition last month. True lovers of grapefruit do not appreciate the orange-skinned, so-called grapefruit. The presence of seeds is also a drawback.

Strawberries.

This fruit suffered through the heavy rains, lines being hard to keep. Prices were: Sydney 1s. 6d. to 4s. per tray; Brisbane 5s. to 10s. per dozen boxes. Poorly filled boxes are still in evidence

Passion Fruit.

Passions are in good demand at 5s. to 13s. Keep out the crinkly fruit and market it separately; it will amply repay the trouble. A useful pamphlet on packing is available upon application to the Department of Agriculture and Stock.

Cucumbers.

These are good money. Prices at Melbourne ranged from 12s. to 16s.; at Sydney from 9s. to 12s.

Lettuce.

Lettuce growers would do well to pack their lettuce in tropical fruit cases, placing the hearts down with the cut stalks upwards, in layers two across, and filling the cases with layers enough to reach to the top. Small heads can be placed in two and one. The count can be marked on the end of the box. This would be a great improvement on the old method of packing in bags, etc.

Publication.

The apple booklet will not be published until the latest export regulations are ratified at the Hobart Conference at the latter end of October. Pamphlets on passion, papaw, custard apple, strawberry, tomato, oranges and lemons are available for distribution, as well as various packing charts.

CONDITIONS GOVERNING THE MAKING OF WINE FOR SALE.

INQUIRIES are frequently received by the Director of Fruit Culture regarding the conditions governing the making of wine for sale. In reply to a communication the Licensing Inspector, Brisbane, recently supplied the following information:—

A grower of fruit, i.e., oranges, pines, mulberries, and plums, is permitted by law to make wine from these fruits, with the addition of sugar, and sell same to the public. Such wine must not contain more than forty per centum of proof spirit by volume.

A license to sell or to manufacture wine from the abovementioned fruits is not required. It is illegal, however, to make wine from the juice of the grape, containing added sugar, honey, glucose or other sweetening matter, without first obtaining the necessary manufacturer's license, which costs £20 per annum, from the Customs Department. Wine made from the juice of the grape, with the addition of the ingredients mentioned, is subject to 20s. per gallon duty.

A grower and maker of wine is permitted to sell wine made by him in any quantity at the premises where it is grown or made, but the sale of such wine in quantities of less than two gallons at one time elsewhere than on the premises where it is grown or made is prohibited.

There is not any restriction as regards the hours of sale during the six business days of the week by a grower and maker of wine, but the sale of any such wine on Christmas Day, Good Friday, Sunday, or Anzac Day is prohibited.

The use of fortifying liquor, such as brandy, whisky, rum, or grape wine, is permitted, but, as already mentioned, "wine" must not contain more than forty per centum of proof spirit by volume.

It is not necessary to guarantee home-made wine under "The Pure Foods Regulations" of "*The Health Acts,* 1900 *to* 1931." Inquiries made at the Health Department elicited the information that there is not any standard as regards the purity of foodstuffs. "Food" is either fit or unfit for human consumption. If impure, and therefore unfit for consumption, a prosecution would, of course, be launched by the Health Department. It would be advisable for fruitgrowers making wine to forward a sample to the Health Department, South Brisbane, for analysis.

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Cheese Making.

By A. R. WILKIN, Cheese Instructor.

CHEESE, on the farm or at factories, is usually made from the evening's and morning's milk mixed together; and, provided the evening's milk is not sour, the mixed milk is preferable to freshly drawn milk.

For cheese making the milk should have sufficient acid to make the batch work in a given time. This should be from two and a-half to three hours from the time of adding the rennet until there is sufficient acid for running off the whey.

The quantity of acid required will be decided by experience, some districts and milks being different from others. It will usually be found to be from ·19 per cent. to ·21 per cent. If the milk is set at ·19 per cent. acidity, and does not work in the three hours mentioned above, more acidity must be developed before adding the rennet. This is done by either letting the milk stand until the desired acidity has developed or by using more lactic starter.

Starters are prepared from lactic culture, which may be procured from the Animal Health Station at Yeerongpilly. Full instructions are sent out with each bottle, and should be adhered to strictly.

When the starter is ready for use, which is generally about the third or fourth propagation, it should be like firm junket showing no whey; and, when thoroughly stirred or poured from vessel to vessel, it should have a smooth and silky appearance, showing no curd lumps, and should not be over ·8 per cent. acidity. Starters not only increase the acid, but add flavour to the cheese, and should be used at any time, provided the quality of the starter is good. Some starters are good for months, others go off quickly and should be replaced.

For the purpose of ascertaining the acidity of milk an acidimeter outfit is necessary. This consists of a 10 c.c. burette, graduated in one-tenths, with a stand; a 9-c.c. pipette; a small porcelain dish and glass rod; a bottle of tenth normal soda solution (strength, 1 c.c. equals ·009 lactic acid); and a small bottle of phenolphthalein. This chemical will turn any soda solution which is free from acid pink.

How to use the Acidimeter.

Take the pipette and suck up the milk or whey to be tested above the 9 c.c. mark. Place the right index finger on the top of the pipette and allow milk to run out until it is on the 9 c.c. mark. Empty the contents into the porcelain dish and add three or four drops of the phenolphthalein. Place the dish under the burette, which has been previously filled to the 0 (zero) mark with the soda solution. Allow the solution to drop into the milk by holding the tap with one hand and stirring the milk with the glass rod. Watch carefully, and immediately the milk turns pink turn off the tap on the burette and read off how much of the solution was used. This will indicate the amount of acid present, viz., if 1·6 c.c. of solution have been run from the burette the milk has ·16 per cent. of acidity (i.e., the acidity equals one-tenth of the reading).

Hot Iron Test.

Another method of ascertaining the acidity of curd, and should be used each day is the hot iron test, which is used as follows:—

Take a piece of iron or iron piping about 3 feet long and $\frac{3}{4}$ inch in diameter and rub all rust scales off with an old rasp or brick; heat the iron in the boiler fire to just below red heat, take a small handfull of curd, and squeeze it until it is fairly dry and well matted together; then take the hot iron in the left hand and hold it on a bench or some convenient place, and place the curd firmly on the iron on a spot where it will stick but not smoke. Then gently draw the curd away from the iron. If there is acid present fine threads like hairs will be noticeable, the length and number of threads indicating the amount of acid present. This test requires practice to know the correct heat and also how to place and draw the curd from the iron.

At the time of running off the whey the curd should show threads about $\frac{1}{4}$ inch long, and at the time of milling $1\frac{1}{4}$ to $1\frac{1}{2}$ inches long. When the curd has sufficient acid by the iron test for running off the whey, an alkaline test should be made and recorded. The reason the hot iron is more dependable is that sometimes other than lactic acid is present in the whey. The alkaline test has the advantage, however, that should the cheese maker be indisposed or off duty it is easier for the novice to follow than the iron test. At the time of milling the curd should show ·8 per cent. acidity, but it is often difficult to get sufficient whey for a test at this period.

Rennet and Colour.

Rennett should be a dark amber colour, free from sediment and cloudiness, and should be of such a strength that 3 or 4 oz. will coagulate 100 gallons of mlik, showing ·2 per cent. acidity at a temperature of 86 degrees Fahr., in ten minutes.

Colour should be bright and free from sediment, and if of standard strength 1 oz. per 100 gallons should be sufficient for local and/or interstate trade and 3 oz. for export.

Salt.

A good, coarse-grained, fine salt should be used at the rate of 1 lb. to each 40 lb. of dry curd; as 1 gallon of milk produces approximately 1 lb. dry curd the amount of salt to be used is reckoned by the number of gallons treated, viz., 1 lb. salt to each 40 gallons of milk.

Bandage.

Bandage is procurable in tubes for almost every size cheese hoop.

How to place the Bandage on Hoops.

First cut the tube about three inches longer than the inside section of the hoop. Put the inside section in its lid and put the bandage around the outside of this section, allowing it to come down about $1\frac{1}{4}$ inches from the top. Now put the other part of the bandage down the inside of the hoop and about an inch towards the centre of the lid. A cheese cap should then be placed in the hoop to cover up that portion of the lid, not covered by the bandage.

Setting the Milk.

When the milk to be treated is in the vat, heat it up to 86 degrees Fahr. and then add sufficient starter to give the required acidity. However, more than 2 per cent. of starter should not be used, as it has a tendency to soften the curd. It would be preferable to let the milk stand until sufficient acidity develops rather than to use too much starter. It is always advisable to thoroughly stir and strain the starter just before adding to the milk in the vat. The milk being ready to set, measure out the required quantity of colour, dilute it in three times its volume in rain water, add it to milk and thoroughly mix with a wooden rake. Then repeat the process with rennet, after the addition of which the milk should be stirred for three minutes. A careful watch should then be kept, to note the time the milk takes to coagulate. This test is made by inserting the finger into the milk and gently lifting it in a forward position to the surface. With a little practice one can tell exactly when coagulation takes place. The curd is generally ready to cut in two and a-half times the time it takes to coagulate, viz., if ten minutes are taken to bring about coagulation, the curd should be ready to cut in twenty-five minutes. This is a good guide, and is generally correct, but must not be taken for granted. The correct method to adopt is, when the 2½ times the period of coagulation has expired, place the index finger deep in the curd and slowly raise it to the surface in a horizontal position. If the curd is ready to cut, it will then show a clean break in front of the finger.

Cutting the Curd.

First use the vertical knife and cut the curd lengthwise by drawing the knife up and down the vat, until the whole has been cut, being careful not to overlap or miss any portion; then cut the curd crosswise, starting at one end and finishing at the other, making sure that the whole is completely done. Next take the horizontal knife and draw it lengthwise up and down the vat, as was done with the vertical knife. The cutting is now finished. A test for acidity should now be made and recorded.

Heating the Curd.

Commence by stirring the curd slowly with the hands for about three minutes, at the same time removing any curd which may be sticking to the vat. Then take the wooden rake, and, after turning the steam on gently, stir slowly until the desired temperature, viz., 100 degrees Fahr., is reached. This should take from twenty-five to thirty minutes. A second test for acid should now be made and recorded. Stirring should be continued for ten minutes after the heat is up, and intermittently until the running off of the whey. The stirring is for the purpose of keeping the curd from matting, thus ensuring an even cook. This will indicate how the batch is working, and will provide valuable data for reference. At this stage, in addition to the tests mentioned, further acid tests should be made every ten or twenty minutes, according to the development of the acidity. It is always advisable to use the hot iron test in conjunction with the alkaline tests. When the curd shows threads ¼ inch long by the iron test it is ready for running off the whey.

Drying the Curd.

After the whey has run off, shift the curd on to one side at the top end of the vat, and stir the curd by turning it over and over, and not allowing it to mat together until it is fairly firm and dry; during this process the curd should be kept in a heap about 6 inches deep. This operation should take five or ten minutes, according to how the curd firms. The curd should now be packed in a uniform heap, about 6 inches deep. Trim the edges of the heap with curd knife, and place the trimmings evenly on top of the heap. After ten minutes cut the curd into blocks about 6 inches wide, turn the blocks over and reverse them end for end; this should be repeated every fifteen minutes to allow the whey to drain off, and so ensure an even cheddaring. When the curd shows one inch threads on the iron, which should occur in about one hour, it should be packed in a heap, say four blocks high. After fifteen minutes reverse the position of the blocks on another heap by bringing the bottom curd to the top.

Curd when ready to mill, which should be about one and a-half hours after the commencement of cheddaring, should show 1½ inch threads by the iron test, and should be bright and silky, and resemble a chicken's breast when torn apart.

Note.—As packing the curd sometimes has a tendency to affect the body of the cheese, the operator should be careful to observe this, and reduce the time specified above accordingly.

Milling the Curd.

Cut the curd into pieces of a suitable size to go into the hopper of the curd mill and go on with the milling. After milling put the curd in a heap similar to that before cheddaring and slowly turn it over until pieces of curd begin to shrink. This generally takes about ten minutes. Salt should then be added at the rate of 1 lb. to each 40 gallons of milk; thoroughly mix the salt into the curd. Then put the curd in a high heap to drain off surplus moisture. Usually this takes about ten minutes; longer if the curd is soft or wet.

The temperature of the curd at salting should be about 80 deg. Fahr., hence the necessity of keeping the curd in bulk during cold weather, and spreading out well after milling, in hot weather.

The cover provided for the milk vat should be used during the setting of the milk, and also the cheddaring of the curd, unless the weather is very hot.

Hooping.

Sufficient curd should be put into the hoops, so that the cheese when pressed will show a ½ inch collar, which means ½ inch higher than the inside runner of the cheese hoop. If there is any curd over after filling the hoops it can be kept until the next day, but should be warmed with water or whey before mixing with the freshly milled curd.

After putting the cheese in the press, gradual pressure should be applied for the first ten minutes, and then increased until you put almost one arm strength on the levers. If too much pressure is applied at first, it has a tendency to lock in the whey and push out the fat.

Dressing the Cheese.

After twenty or thirty minutes pressing, the cheese should be taken out of the press. Remove the lid from the big end, take off the outside runner, pull up the bandage, using a little pressure to remove any creases that may have formed down the side of the cheese, then replace outside runner. The cap should now be put on the top of the cheese and the bandage neatly turned in towards the centre over the cap. If the bandage is too long it should be cut with scissors so that it will overlap the cap by ½ inch. If any curd has squeezed over the edges of the hoop, when the outside runner is removed it should be trimmed off with a knife. After dressing the cheese a round hessian cap, about the size of the cheese cap, should be put on top to press the bandage and cap into the cheese. One of these caps could be put on the other end of the hoop when dressing (caps cut from salt bags are quite suitable for this purpose), then the lid should be replaced.

Pressing the Cheese.

The cheese, after being dressed, is put back in the press, and screwed up to about one arm strength pressure. A couple of buckets of scalding water should then be thrown over the hoops. This helps to put a rind on the cheese, and prevents cracking.

If the press is not of the continual pressure type, it will be necessary to keep the press well screwed up. You can now put on more than one arm pressure, easing if you see any curd squashing out. Be sure and screw up before retiring and first thing in the morning. Eighteen to twenty hours are sufficient pressing for small cheese, and two days for medium and export sizes.

After pressing, the cheese should be taken from the hoops. Remove the hessian caps, and wipe the cheese with a dry cloth, removing any pieces of curd that may have pressed through the bandage.

Marking the Cheese.

Put on the date and brand, allow the cheese to dry, then remove same to the curing room. Wet cheese are likely to mould in curing room. Old cheese are more difficult to brand on account of the greasy nature of the surface.

Curing Room.

The curing room should be kept at a temperature not higher than 70 deg. Fahr., and not below 60 deg. Fahr. The room should also be well ventilated, and plenty of fresh air circulated, provided that the natural temperature of the air is suitable. The air at night time will usually be found to be satisfactory. All cheese should be turned each day, so that the moisture will be evenly distributed.

In conclusion, it must be realised that cheese making is a scientific profession, and will not admit of any guess work if success is to be achieved. Further, it depends upon the purity, quality and lactic content of the milk, which can only be obtained by the strictest cleanliness being observed, from the milking of the cow until the product is consumed. All buildings and surroundings must be kept in a clean and sanitary condition; all vessels and utensils that come in contact

with the milk should be kept scrupulously clean and scalded immediately before use, to ensure that there is no risk of contamination by harmful bacteria.

Plant Required.—Steam boiler for heating and steaming purposes, double-jacketed milk vat, cheese knife with vertical blades, cheese knife with horizontal blades, curd mill, wooden curd rake, cheese press to suit size of cheese, cheese hoops, sizes as required, ordinary butcher's knife for cutting curd, 2 thermometers bearing Government certificate, one measure glass graduated in ounces, acidimeter outfit, pair scales for weighing cheese, salt, &c., pair scissors for cutting bandages, brand, for branding cheese, milk test flasks, milk pipettes, acid measure.

Material Required.—Bandage correct size for hoops, cheese caps correct size for hoops, canvas cover for cheese vat, broom or whisk for sweeping curd in vat, broom for floor, rennet, colour, and salt, alkalic solution, phenolphthalein, sulphuric acid, formalin, and washing soda.

PIG LITTER RECORDING.

Four litters of pigs, whose growth to weaning time at 56 days old was recorded recently by the Department, have given the following interesting results:—

Large White litter from the sow Laurel's Lady Fay, and sired by Gatton Junker, owner A. G. Stewart, Cedar Pocket, Gympie—

Weight in lb. at 56 days.

Boar	Boar	Boar	Boar	Boar	Boar	Sow	Sow	Sow	Sow	Total	Avg.
43	49	46	35	37	38	44	45	40	48	425	42.5

Wessex Saddleback litter from the sow Holmsleigh Ace (imp.), and sired by Holmsleigh Surprise (imp.), owner R. Turpin, Lowood—

Weight in lb. at 56 days.

Boar	Boar	Sow	Sow	Sow	Sow	Sow	Sow	Total	Avg.
47	37½	53	40	49	45½	48	46½	366½	45.8

Middle White litter from the sow Wootha Peggy, and sired by Wisteria Hero 6th, owner H. O. Rees, Maleny—

Weight in lbs. at 56 days.

Boar	Boar	Boar	Boar	Boar	Sow	Sow	Sow	Total	Avg.
33	35	31	37	31	34	34	32	268	33.5

(Sow's first litter.)

Large White litter from the sow Highfields Peg II., and sired by Grenier Goliath, owners Hibberd Bros., Indooroopilly—

Weight in lb. at 56 days.

Boar	Boar	Boar	Boar	Boar	Boar	Boar	Sow	Sow	Total	Avg.
37½	40	36	46	36½	42	23	37	38	336	37.3

Seeds Every Farmer Should Know.

By F. B. COLEMAN, Officer in Charge, and R. J. HOLDSWORTH, Inspector, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

DATURA STRAMONIUM (Figure 1).

Common names.—Datura, stramonium, thorn apple, castor oil plant. In other parts of the world it is known as Jimson weed, mad apple, and devil's apple.

Description.—Dull, black, some grey, and a few light-brown flat seeds. Irregular surface covered with small pits.

Size.—3 x 2½ mm. and 1¼ mm. thick.

Occurrence.—Found in samples of the following seeds:—Japanese millet, Sudan grass, foxtail millet, white French millet, white panicum, canary; sometimes in prairie grass, lucerne, barley, oats; also in hay and chaff.

DATURA TATULA.

Seeds of this plant are indistinguishable from those of *Datura stramonium.*

DATURA FEROX (Figure 2).

Description.—Dull grey, few black and a few lighter grey flat seeds. Irregular surface covered with small pits.

Size.—4½ x 3½ mm. and 1½ mm. thick.

Occurrence.—Sometimes found in Sudan grass and canary seed.

DATURA METEL (Figure 3).

Description.—Dull, brown flat seed. Pitted surface with deep irregular furrows marked near the edge three parts of the way round.

Size.—5 x 3½ mm. and 1½ mm. thick.

Occurrence.—Sometimes found in Sudan grass and canary seed.

DATURA FASTUOSA (Figure 4).

Description.—Dull, yellow flat seed. Pitted surface with deep irregular furrows round the edge.

Size.—6 x 4 mm. and 1½ mm. thick.

Occurrence.—Sometimes found in Sudan grass and canary seed.

[mm. = millimetre. 25·4 mm. = 1 inch.]

The seeds of all species of Datura, under the Pure Seeds Acts, and the seeds, plants, and parts of such plants under the Stock Food Acts are totally prohibited on account of the poisonous properties attached to this weed.

The following species have been recorded in Queensland:—

Datura stramonium,
Datura tatula,
Datura ferox,
Datura metel,
Datura fastuosa.

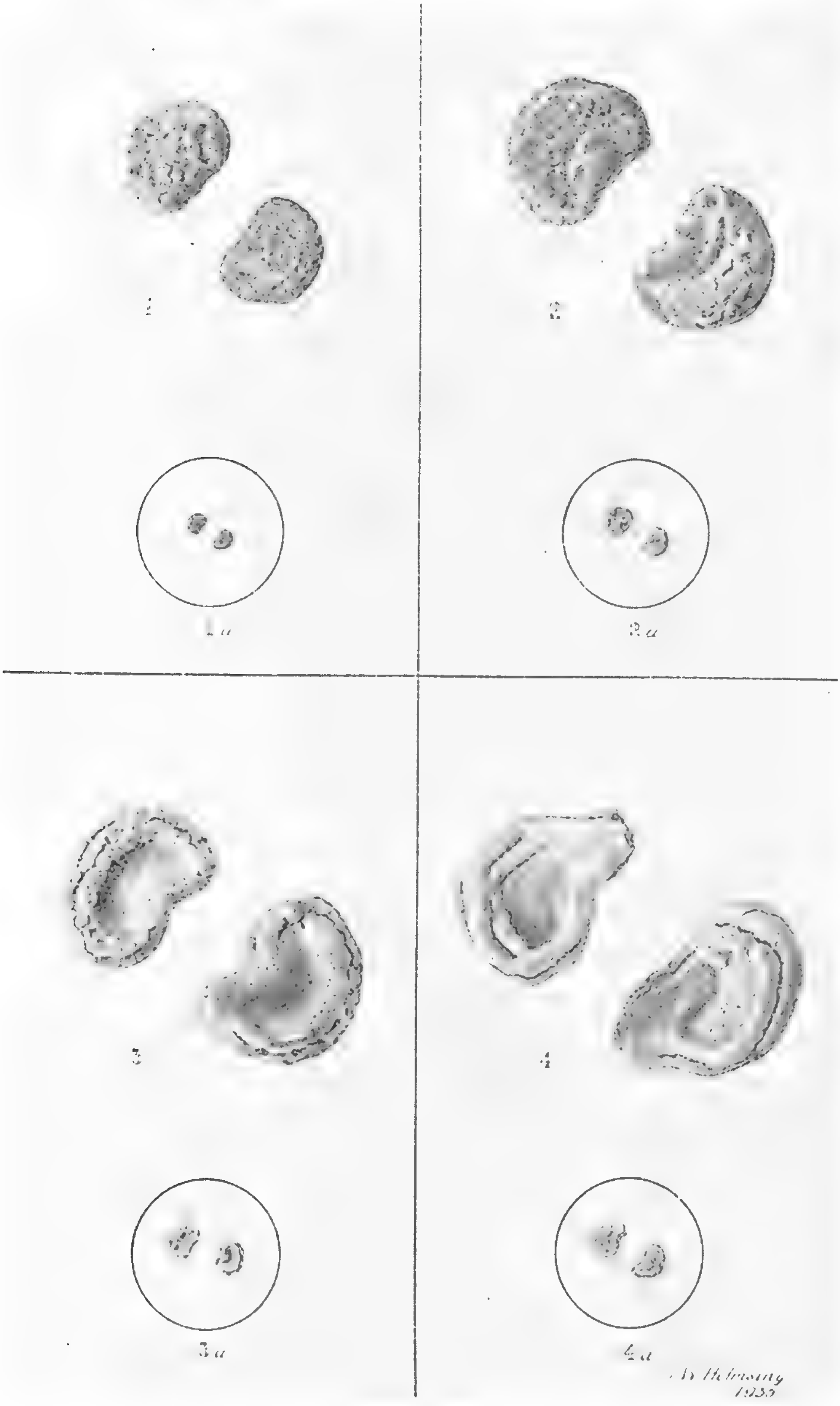


Plate 162.

Fig. 1.—*Datura stramonium* × 5.

Fig. 1a.—*Datura stramonium* natural size.

Fig. 2.—*Datura ferox* × 5.

Fig. 2a.—*Datura ferox* natural size.

Fig. 3.—*Datura metel* × 5.

Fig. 3a.—*Datura metel* natural size.

Fig. 4.—*Datura fastuosa* × 5.

Fig. 4a.—*Datura fastuosa* natural size.

The most common species—Datura stramonium, an annual—is a coarse, pale green, repulsive, ill-smelling, dangerously poisonous plant found growing in Queensland on cultivated ground, roadways, and waste land; it bears trumpet-shaped white flowers.

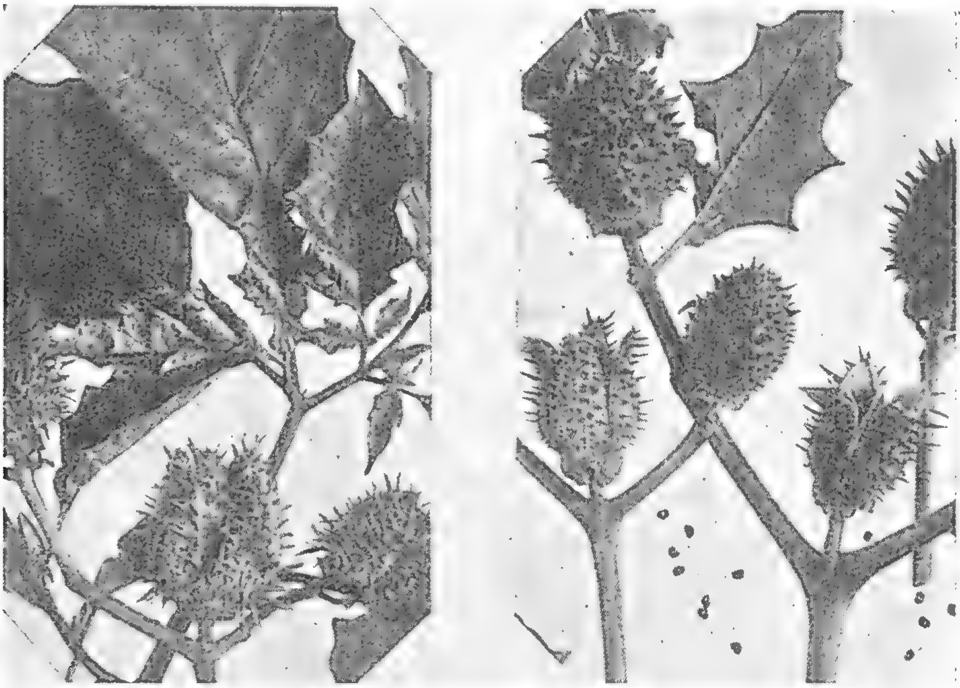


Plate 163.
Datura stramonium.

Every year considerable quantities of Sudan Grass (*Sorghum Sudanense*), Foxtail Millet (*Setaria, Panicum*), and Japanese Millet seeds are found to contain seeds of this plant and have to be destroyed; action is being taken for a closer inspection of the seeds sold in an endeavour to eliminate Datura.

Grazing animals refuse to eat the plants, but when found as an admixture in chaff the seeds and parts of the plant are consumed—with fatal results.

The leaves of *Datura stramonium* have medicinal properties similar to those of Belladonna, and the inhaling of the fumes from the burnt leaves is prescribed to relieve spasmodic asthma. A tincture is made from seeds of *Datura fastuosa* variety *alba,* which is also used medicinally.

Owing to the dangerous nature of the seeds and leaves they should not be used indiscriminately.

Toxic Principle.

According to Long, in "Plants Poisonous to Live Stock," the Thorn Apple is usually stated to contain the highly poisonous narcotic alkaloid Daturine .... An investigation conducted at the Imperial

Institution (Bul. Imp. Inst., 1911) showed the amount of alkaloids present in European specimens (of Datura stramonium) to be

Seeds, 0·21 to 0·48 per cent.

Leaves, up to 0·4 per cent.

Stems, average 0·22 per cent.

Roots, average 0·17 per cent.

Among humans it has been recorded that the greatest number of accidents have occurred among children who have eaten the half-ripe seeds, which have a sweetish taste.

No doubt many farmers are well acquainted with the nausea caused to men who are for any length of time engaged upon hoeing out Datura.

Propagation.

All species herein mentioned are reproduced by means of seeds and are annuals, therefore every endeavour should be made to kill the young plants before they flower. Unfortunately, in too many instances does one see attempts to kill weeds by various methods when the plants are in full seed, with the result that although the parent plant is rooted out it still has enough vitality to mature a crop of seeds. It cannot be emphasised enough that *the time to eradicate annual weeds is before they flower,* and at no other stage can one expect to achieve satisfactory results for one's efforts.

The large area over which these objectionable weeds are to be found is due to the seed being spread as an impurity in agricultural seeds or hay and chaff, also to the fact that animals do not assist in checking their growth by grazing.

In the event of the presence of Datura being suspected, farmers and others should forward specimens to this Department for identification—which is carried out free of charge—rather than run the risk of distributing this objectionable plant over their land.

The following appeared in this Branch's Annual Report for 1923:—

> "Unfortunately, many farmers and merchants cannot identify even the most common weed seeds, some of which, such as Datura, are so poisonous that if the farmer recognised the plants on their first appearance he would postpone all other work until they were destroyed, or as an alternative cut the weeds down before they produced seed. Apart from the fact that weed seeds easily shatter out before or during the harvesting of the crop, it is well to recollect that they do not germinate with the regularity of crop-seeds, and some may remain dormant in the ground for several years."

Any person who sells any seeds or grain for sowing containing Datura seeds, or any hay, chaff, or any stock food containing seeds or any part of the Datura plant, is liable to prosecution.

On reference to the July copy issued in 1917 of this journal, on pages 31 to 35, will be found further information by Mr. C. T. White, the Government Botanist, relating to these plants.

The Queensland Pig Industry Act.

DESIGNED entirely in the interests of Queensland farmers who are producing pigs as a profitable branch of live-stock husbandry, "*The Pig Industry Act of* 1933" was assented to on 11th October, 1933, in the Queensland Legislature, having received Royal Assent in accordance with State law. The Act actually came into operation on 23rd August, 1934, which date is referred to as "the commencement of this Act." The Act is divided into twenty-five sections, while there are twenty-three additional provisions in the Schedule to the Act, which latter are largely covered by the Regulations. Sections 1 to 4 of the Act may be referred to as the administrative portion, covering, among other things, interpretation of various terms used in the text—thus, the word "dealer" is interpreted as meaning "any person who engages in the buying and selling of pigs or pig carcasses"; "piggery" means and includes any land, buildings, or place where pigs are depastured or kept; and similarly with other terms.

Inspectors under this Act have, for the purposes of the Act, all the powers and functions of an inspector under "*The Dairy Produce Acts*, 1920 *to* 1932," "*The Diseases in Stock Acts*, 1915 *to* 1931," "*The Slaughtering Act of* 1898," or any Act or Acts amending the same or in substitution therefor respectively.

Section 5 gives the inspector power of entry and inspection, and in his official capacity he may enter and inspect any premises or place where pigs are depastured or kept, and any factory. He is empowered to deal with any position arising as a result of unclean piggeries, disease in pigs, impure or unwholesome water or food, &c.; and he may forthwith order the necessary steps to be taken to remedy the defect.

Section 7 sets out the duty of the owner in notifying disease; isolating diseased pigs; disposing of diseased carcasses.

Section 8 prohibits the feeding of meat, offal, or blood unless such foodstuffs are thoroughly cooked.

Section 9 requires the owner to render any assistance required by the inspector in the carrying out of his duties, and in searching for and discovering the cause of disease or any source of contamination or infection to which pigs may be exposed.

Section 10 deals with the marking of pigs by a representative of a factory—i.e., a sufficient mark to ensure identification of the vendor or consignor if pigs are forwarded direct to a factory. Such identification marks are, of course, necessary in the ordinary course of marketing; otherwise there would be endless confusion.

Section 11 requires every autioneer, agent, dealer, factory, or butcher to keep a record in respect to every transaction in pigs with which he is concerned—that is, the date, number, description, distinguishing marks, name, and address of vendor and of purchaser, and such other particulars as may be prescribed.

Section 12 prohibits payment for the whole or any part of a carcass which has been condemned by an inspector as unfit for food of man; this is an important section, as payment for diseased carcasses has proved to be a most unsatisfactory way of eliminating disease.

Section 13 deals with grading of carcasses, and is more fully described in dealing with the Regulations.

Section 14 provides the inspector with power in marking of quality of carcass pork and bacon sides.

Sections 15 to 25 give powers of administration under this Act and provide for penalties in case of offence, &c.

The Schedule to this Act covers a fairly wide range of provisions and deals with subject-matter covered by regulation.

The Regulations.

In the Regulations additional terms are interpreted—thus, the grader is the person duly appointed as such under the Act and/or his assistants duly appointed under the Act.

A saleyard is a live-stock market operating as a saleyard, a receiving and/or trucking yard, or place where pigs are sold, bartered or exchanged, or otherwise disposed of, &c.

Regulations 1 and 2 are purely administrative.

Regulation 3 sets out requirements in conduct of examination of graders and/or inspectors under this Act, and is largely an administrative clause.

Regulation 4 provides that no person shall be employed in the grading of pork or bacon pig carcasses unless he holds the necessary certificate of competency under this Act.

Regulation 5 deals with management of piggeries which are not specifically provided for in any of the other Acts under which inspectors work in administering this Act.

Provision is also made that pigs shall not be allowed to trespass or to pollute running water. This Regulation also provides the inspector with powers to prevent introduction and spread of disease among pigs, &c.

Regulation 6 deals with identification of pigs, and requires that every pig offered for sale, barter, or exchange be identified in accordance with this Act and its Regulations, the object being to facilitate tracing of disease to source of origin. This regulation is a particularly important one that will require the hearty co-operation of everybody interested in the progress of the pig industry.

Regulation 7 deals with grade definitions and defines the various grades into which carcasses will be graded by the grader at the factory.

Provision is made for two particular grades in each group—thus, there will be in baconers for the Australian trade a grade defined as choicest, and another first grade; carcasses not coming within these grades will be second grade or smallgoods grade, as the case may be.

In export baconers and in export porkers the grades are those required by the *Commerce (Trade Descriptions) Acts,* 1905 *to* 1930, and are the grades in operation at present under Commonwealth veterinary inspection.

In porkers for the Australian trade, in addition to the two grades referred to as "G.A.Q." (good average quality) and "F.A.Q." (fair average quality), there is a second grade and a reject porker grade. Boars and stags shall be accepted, graded, and paid for only when of suitable quality and age for manufacturing into edible products.

Regulation 8 deals with payment for pigs sold for slaughter, and requires that in the case of choicest or highest grade carcasses there shall be paid a premium of one halfpenny per pound above the rate paid for next grade. It is felt that the introduction of this system of payment will be entirely satisfactory, and will do much to encourage the breeding and marketing of better quality and properly finished pigs. This Regulation provides that when live pigs are sold at public auction and where carcass pork graded as provided is sold at public auction and/or by private contract, the clause requiring payment of premium shall not apply, for the reason that purchase of pigs at public auction and carcass pork ditto or by private contract requires the buyer to pay maximum value to secure the best quality offering, and, therefore, payment of an additional premium would not be workable.

Regulations 9 and 10 deal with the sale of live pigs by public auction and sale of carcass pork respectively.

Regulation 11 provides for the issue with account sales of grade certificates—i.e., where pig carcasses are paid for on a basis of grading. It is desirable the farmer be informed as to the reason why carcasses are paid for at below choicest or highest-paid grade, if they are so graded and paid for; and this Regulation paves the way for this information to be supplied.

Regulation 12 provides for check grading and for vendor to be supplied with a certificate of grade of all carcasses other than those of highest-paid grade.

The check grader shall also determine the grade of any carcass reduced in value by causes obviously occurring after purchaser has taken delivery from vendor. This clause provides for losses due to injuries in transit, &c., not actually covered by any preceding or following clause.

Check grading protects interests of the farmer and should be the means of providing him with necessary information, for, as stated, the farmer is to be informed in all cases where his pigs are not of choicest grade. It is hoped to be able to follow up grade certificates and indicate to the farmer how to overcome faults in type and condition, and how to produce and market the most desirable class of animal.

Regulation 13 deals with grade marks, and paves the way for identification by indelible grade marks of graded carcasses, thus preventing errors and enabling a more accurate check to be kept of the different grades. Where grading is carried out by Commonwealth officers (as in the case of pork for the export trade), only such grade marks are required under the *Commerce (Trade Descriptions) Acts, 1905 to 1930*, will be applied.

Regulation 14 provides for compulsory refund of price paid for any pig whose carcass is subsequently slaughtered and condemned within thirty days of sale by Government inspectors as unfit for the food of man. Many pigs are purchased in Queensland and are paid for prior

to slaughter. All such pigs come within the ambit of this Regulation and thus are brought into line with those consigned direct to factories and not paid for until slaughter and inspection is complete. The Regulation makes it compulsory for the purchaser to demand the refund, and for the vendor to pay within a stated period. This clause will, it is believed, be of inestimable benefit to the industry in this State.

Regulation 15 has reference to a similar subject, but deals with the purchase of live pigs by dealers who thereafter consign to factories for slaughter within thirty days. In this case the dealer is placed on the same footing as the farmer, and will be compelled to refund in case of condemnation. This clause will apply to every such transaction between a dealer and an owner of a factory.

Regulation 16 requires the owner of a factory to supply to the Minister a list of trade marks used, &c.

Regulation 17 requires the owner of a factory to supply to the Minister a list of all products manufactured or sold by such factory.

Regulation 18 provides for the use of more than one trade mark where so desired by the owner of a factory.

Edible products shall be identified with a different trade mark from inedible products such as fertilizer.

Regulation 19 makes it an offence to beat a pig with a whip, stick, or other weapon capable of bruising or damaging the carcass of such pig. Similarly, it will be an offence to ill-treat a pig in any way, penalty being such as is provided for in the Act.

Regulation 20 indicates the scope of the Regulations and is largely administrative.

THE excellent rains received from the 9th to the 12th September throughout the whole of the agricultural and pastoral areas have greatly enhanced the prospects of the industries concerned. The falls were particularly heavy in the Maranoa and South-west, and in these districts the best spring experienced for many years is in evidence. A good season appears assured up to Christmas, and the majority of agisted stock have now returned to home pastures. Stock prices have naturally hardened, owing to the demand for breeding stock to replace losses, but are not likely to rise to high levels, owing to the depleted finances of those concerned. Although the central district received lighter rains than elsewhere, they were sufficient to be of great benefit to the herbage, which had been very backward in growth.

Dairy farmers are benefiting by much increased returns and the growth of their pastures, while the opportunity has been taken to sow large areas of all spring crops under favourable conditions. With the advent of warmer weather weeds will be making great headway where not checked by inter-row cultivation or the working of the fallows. Crop returns are greatly increased where due attention is given to weed eradication and the preservation of an effective soil mulch.

Wheat.

The appointment of the members of the State Wheat Board for the period 1st September, 1935, to 31st August, 1938, recently announced by the Minister for Agriculture and Stock, will be welcomed by growers as giving greater stability to the industry.

Some high returns should be received in the Dalby and Maranoa districts, but the rains throughout the main Downs wheatlands were rather late to assure an average yield. An encouraging feature is the recent rise in world prices, wheat now being quoted at a higher level than for some years past.

Cotton.

The 1934-35 cotton crop is completed, with a total production of 14,505 bales of lint, which, although appreciably lower than appeared

at mid-season would likely be obtained, has to be considered satisfactory, considering the exceptionally dry conditions that ruled from January through the rest of the season.

The prospects for the coming crop appear very promising in all districts except the South Burnett and Southern, where further rain is badly required. The frequent soaking rains which have been experienced in the Central district have influenced some rather early planting, but a majority of the farmers have taken advantage of the favourable season to prepare excellent seed-beds first, and are now planting under ideal conditions. Provided further rains occur early in October to enable the rest of the districts to get planted, the cotton crop will get off to an excellent start.

Purchases of planting seed still continue in considerable quantities, the total sold being well ahead of comparable dates of last season—sufficient seed to plant at least 50,000 acres having already been despatched.

Tobacco.

Generally, good prices have been realised for the past season's leaf, especially in the Mackay-Sarina district, where the bulk of the leaf produced was of high quality. However, dissatisfaction is again prevalent amongst growers over prices received for lower grade leaf, but this in many instances is the fault of irregular grading and the marketing of immature leaf.

Activities for the coming season have now commenced in all districts, while at Texas and Inglewood seed beds are fast reaching the planting-out stage.

Sugar.

Light rains of a spasmodic nature were experienced in most cane areas during September. With the advent of warmer conditions the young crops will therefore benefit, while the condition of the mature cane will be maintained. The mills are crushing the crop at a satisfactory rate, and the sugar content of the cane is high.

All areas report good strikes in the young plant crop, which has, therefore, made an excellent start for the 1936 harvest.

POINTS IN SELECTION OF SEED MAIZE.

Select ears which are heavy in proportion to their size when dry.

Soundness, weight, plumpness, and good bright colour of grain are of more importance than depth of grain. Deep grain may be light and chaffy and of poor colour and feeding value.

Select ears true to type or thoroughly representative of the variety.

Avoid ears with wide furrows between the rows of grain.

Soft, rough-dented grain is more likely to carry the infection of root, stalk, cob, and grain rot disease than medium-hard grain of smooth to medium-rough dent.

Do not strive too much after small cores.

Well-filled tips make a good show point, but poorly filled tips do not necessarily disqualify otherwise good seed ears.

Straight regular rows are only a fancy show point, and need not be stressed greatly in selecting seed.

Avoid selecting ears in which the grain is split, discoloured, or showing any external sign of disease.

Also avoid ears which on being detached from the stalk show a shredded, stringy, or discoloured (especially pink coloured) stalk attachment.

Avoid ears which shell grain with a stringy tip cap.

The 1935 Brisbane Exhibition Championship Awards.

Plate 164.
Champion Shorthorn Bull, Mr. J. T. Scrymgeour's Netherby Royal Challenge.

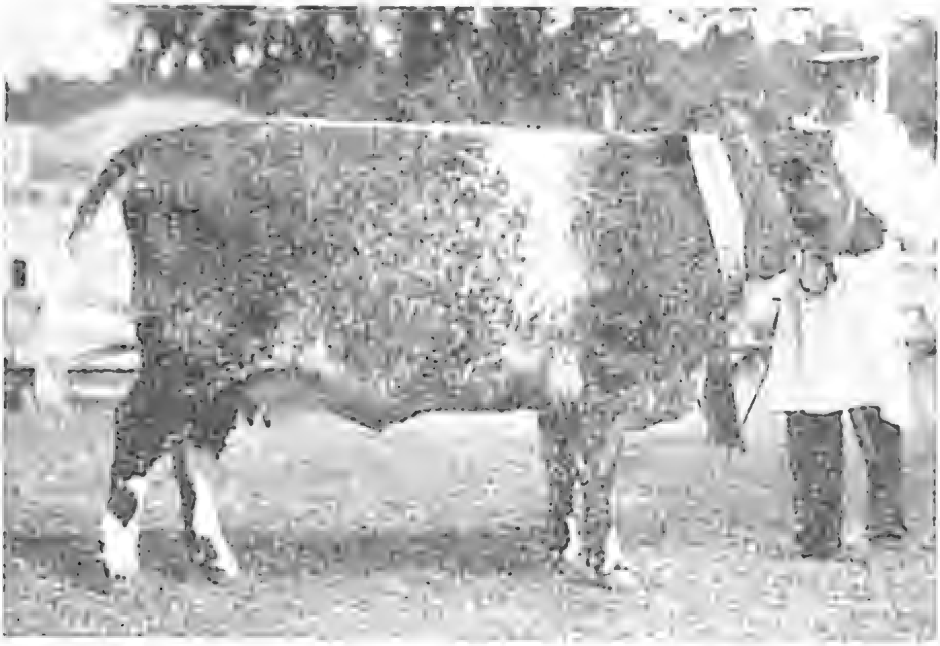


Plate 165.
Champion Shorthorn Cow, Mr. J. T. Scrymgeour's Netherby Mistress Lovely.

Plate 166.
Champion Polled Hereford Bull, Mr. S. A. Plant's Trevanna King.

Plate 167.
Champion Polled Hereford Cow, Miss L. A. Dearden's Daisy Mount Princess Bessie.

Plate 168.
Champion Hereford Cow, Mr. E. R. Reynold's Ennisview Lady Illustrious.

Plate 169.
Ennisview Lady Illustrious, Champion Hereford Cow, with Calf at Foot.

Plate 170.
Champion A.I.S. Bull, Kilbirnie Pride, owned by Macfarlane Bros., Radford.

Plate 171.
Champion A.I.S. Cow, Mr. J. Phillips' Trevor Hill Princess 2nd.

Plate 172.
Champion Jersey Bull, Oxford Brown Victory, the property of Mrs. E. Stanton, Neurum.

Plate 173.
Messrs. E. Burton & Son's Champion Jersey Cow, Oxford Ginger Girl.

Plate 174.
Champion Ayrshire Bull, Myola Bonny Boy, the property of Mr. G. Norgaard.

Plate 175.
Champion Ayrshire Cow, Benbecula Tulip, the property of Mr. T. Holmes.

PLATE 176.
Champion Guernsey Cow, Mr. A. Cooke's Linwood Sylvia.

PLATE 177.
Champion Friesian Bull, Starling's Actuary, the property of Mr. W. H. Grams, Tent Hill.

Plate 178.

Messrs. Hickey & Son's Champion Friesian Cow, Glendalough Corndale 2nd.

Plate 179.

Mr. J. A. Rudd's Champion Pony Stallion, Halford Sensation.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Ayrshire Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of August, 1935 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Snowdrop II. of Blacklands (365 days)	A. M. Johnson, Gracemere	4,420·35	612·056	Premier of Hillview
	SENIOR 4 (OVER 4½ YEARS), STANDARD 330 LB.			
College Queen	Queensland Agricultural High School and College, Gatton	9,173·39	433·237	Fussy's Kitchener of Hillview
	JUNIOR 4 (UNDER 4½ YEARS), STANDARD 310 LB.			
Sunnymede Fairy 3rd	E. O. Althouse, Cloyna	8,331·62	316·524	Larry of Dnalwon
	JUNIOR 3 (OVER 3½ YEARS), STANDARD 270 LB.			
Rocklyn Ruby	T. Strain, Wondai	6,837·42	289·622	King of Sunnyside
Golden View Trixie	S. L. Holmes, Goomburra	6,781·67	277·751	Wunulla of Perfection
	SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.			
Stirling Flora (365 days)	J. W. Crabb, Woodstock	11,259·44	439·256	Defender Boy of Orchard's Daisy
Rocklyn Shamrock (272 days)	T. Strain, Wondai	8,761·04	359·622	King of Sunnyside
	JUNIOR 2 (UNDER 2½ YEARS), STANDARD 230 LB.			
Trevor Hill Bluebell (254 days)	G. Gwynne, Umbiram	7,781·25	312·922	Viceroy of Wilga Vale
Blacklands Royal 8th	A. M. Johnson, Gracemere	7,065·8	280·4	Blacklands Major
Waverley Princess	R. A. Scott, Toogoolawah	6,623·35	256·658	Waverley Chieftain
Marn Pet	R. Martin, Coalstoun Lakes	5,725·26	245·497	Glenlee Victory
Happy Valley Miss Myrtle	R. R. Radel, Coalstoun Lakes	5,495·74	238·033	Burradale Emperor
	AYRSHIRE.			
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Fairview Bonnie Angela	R. M. Anderson, Southbrook	9,926·45	386·23	Fairview Jaunty's Masterpiece
	SENIOR 4 (OVER 4½ YEARS), STANDARD 330 LB.			
Fairview Lady Bess	R. M. Anderson, Southbrook	12,719·5	488·662	Longland's Bonnie Willie 2nd

GUERNSEY.				
SENIOR 3 (OVER 3½ YEARS), STANDARD 290 LB.				
Moonji Olivia	W. Smee, Peeramon	5,923·4	318·203	Caramarra Favour
SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.				
Lilac Perfection	W. Smee, Peeramon	4,856·05	279·884	Moonji Knut
JUNIOR 2 (UNDER 2½ YEARS), STANDARD 230 LB.				
Willowbrae Princess	H. T. Blanch, Eudlo	5,846·75	303·561	Linwood Lone Star
JERSEY.				
MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Fairy Girl of Rosedale	J. Schull, Oakey	6,643·6	370·014	Oxford Prince Palatine
SENIOR 4 (OVER 4½ YEARS), STANDARD 330 LB.				
Keystone Governess	A. Walker, Dawn	7,252·3	353·082	Trinity Radio
JUNIOR 4 (UNDER 4½ YEARS), STANDARD 310 LB.				
Vanette of Linwood	F. Kath, Ellesmere	7,640·75	421·516	Aerofoil of Banyule
Connie of Linwood	F. Kath, Ellesmere	7,591·95	382·817	Aerofoil of Banyule
SENIOR 3 (OVER 3½ YEARS), STANDARD 290 LB.				
Glengariffe Noble Carnation 2nd	Cox Bros., Witta	5,104·1	301·416	Retford Golden Heritage
JUNIOR 3 (UNDER 3½ YEARS), STANDARD 270 LB.				
College Mildred	Queensland Agricultural High School and College, Gatton	6,916·26	355·339	Burnside Renown
Oxford Dawn	A. H. Koppen, Peeramon	6,289·15	327·111	Trinity Ambassador
Molly of Linwood	F. Kath, Ellesmere	5,748·4	310·223	Aerofoil of Banyule
Faith of Arranmore	J. M. Newman, Caboolture	4,860·1	285·959	Trinity Prince of Wales
SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.				
Snowdown of Peeramon	A. H. Koppen, Peeramon	5,141·6	285·86	Roseboy of Richmond
Trecarne Myrtlette 2nd	C. W. Barlow, Wyreema	4,293·15	252·250	Trecarne Renown
JUNIOR, 2 (UNDER 2½ YEARS), STANDARD 230 LB.				
Maiwand Mistletoe 2nd	Queensland Agricultural High School and College, Gatton	5,965·84	338·61	Aveley Rex
Pineview Beryl	J. Hunter and Sons, Borallon	4,991·97	301·493	Oxford Jeweller
Waltham Farm Daffodil	McGregor Bros., Yalangun	4,453·28	284·616	Trecarne Reminder
Fauvic Luxury	H. Cochrane, Kin Kin	5,654·4	271·508	Condong Double Prometheus
Dora of Billabong	J. Mollenhauer, Moffattdale	4,973·24	265·22	Bruce of Calton
Bonnie Brae Dainty Favourite	R. A. Anderson, Yandina	5,291·6	262·18	Cinders of Burnleigh
College Milkmaid	Queensland Agricultural High School and College, Gatton	5,708·43	259·635	Burnside Defender
Lucy of Hopeview	H. T. Gibson, Kingaroy	4,926	257·97	Reminder of Calton
Greenstock Pride	McGregor Bros., Yalangur	4,438·76	250·193	Westbrook Scots Noble 3rd
Model of Romsey	J. Wilton, junr., Raceview	3,720·32	232·926	Retford May's Victor

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 1st October, 1935, a ten minutes' talk, commencing at 7 p.m., will be given on subjects of special interest to farmers.

Following is the list of lectures for October, November, and December, 1935:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, October 1st, 1935—"Planting Cotton," by R. W. Peters, Cotton Experimentalist.

Thursday, October 3rd, 1935—"Summer Pasture Plants," by C. W. Winders, B.Sc., Agr., Assistant in Agronomy.

Tuesday, October 8th, 1935—"Summer Pasture Plants," by G. W. Winders, B.Sc., Agr., Assistant in Agronomy.

Thursday, October 10th, 1935—"Over-run and the Factors Which Affect It," by G. B. Gallwey, Inspector of Accounts.

Tuesday, October 15th, 1935—"Cultivating Cotton," by R. W. Peters, Cotton Experimentalist.

Thursday, October 17th, 1935—"Avocado Growing," by H. Barnes, Director of Fruit Culture.

Tuesday, October 22nd, 1935—"When the Cows Come Home," by J. F. Reid, Editor of Publications.

Thursday, October 24th, 1935—"Seasonal Notes," by A. E. Gibson, Director of Agriculture.

Tuesday, October 29th, 1935—"Those Backward Chickens," by P. Rumball, Poultry Expert.

Thursday, October 31st, 1935—"Shade Trees," by W. D. Francis, Assistant Botanist.

Tuesday, November 5th, 1935—"Thinning Cotton," by R. W. Peters, Cotton Experimentalist.

Thursday, November 7th, 1935—"The Preparation of Wool for Market as from Small Holdings and Mixed Flocks," by J. Carew, Senior Instructor in Sheep and Wool.

Tuesday, November 12th, 1935—"The Pineapple Industry," by H. Barnes, Director of Fruit Culture.

Thursday, November 14th, 1935—"The Eradication of Tuberculosis from Dairy Herds," by J. C. Maunder, B.V.Sc., Government Veterinary Surgeon.

Tuesday, November 19th, 1935—"Keeping Pigs Healthy," by L. A. Downey, Instructor in Pig Raising.

Thursday, November 21st, 1935—"Market Garden Pests," by J. A. Weddell, Assistant Entomologist.

Tuesday, November 26th, 1935—"Some Factors in the Control of Worm Parasites," by Dr. F. H. S. Roberts, Entomologist.

Thursday, November 28th, 1935—"Tobacco Culture and Varieties Grown in Southern Rhodesia," by R. A. Tarrant, Instructor in Agriculture.

Tuesday, December 3rd, 1935—"Types of Barns and Methods of Curing Employed in South Africa," by R. A. Tarrant, Instructor in Agriculture.

Thursday, December 5th, 1935—"Pork Products on the Breakfast Menu," by E. J. Shelton, Senior Instructor in Pig Raising.

Tuesday, December 10th, 1935—"Our Best Market for Butter and Its Requirements," by G. H. E. Heers, Director of Dairying.

Thursday, December 12th, 1935,'' Marketing Tropical Fruit in Australia,'' by J. H. Gregory, Instructor in Fruit Packing.

Tuesday, December 17th, 1935—''Packing Houses and their Equipment,'' by J. H. Gregory, Instructor in Fruit Packing.

Thursday, December 19th, 1935—''The Value of Silage,'' by H. B. Ball, Assistant Experimentalist.

Tuesday, December 24th, 1935—''Farming in France—A Christmas Memory,'' by J. F. Reid, Editor of Publications.

Tuesday, December 31st, 1935—''The New Year in Agriculture,'' by J. F. Reid, Editor of Publications.

TREE PLANTING—PROTECTION OF BIRD LIFE.

The need for an active policy of tree-planting, particularly in relation to the encouragement and protection of bird life, was emphasised by the Director of Agriculture (Mr. A. H. E. McDonald), Department of Agriculture, New South Wales, recently.

Mr. McDonald said that in recent years public interest had become intensified in the planting of trees. This was due largely to the laudable efforts of the forest leagues and other societies and individuals, who had realised that the land surface had become bare of trees, and that this had not only caused a dreariness of aspect, but had brought about dangers to the community.

Only a few years ago Australia over a great part of its area was covered by a dense growth of trees. This was especially so in its more favoured parts. The trees were originally considered a serious impediment to the productivity of grass and crops desired by settlers, and timber growth came to be regarded as man's chief enemy.

The stage had now been reached when whole sections of the country were completely bare of trees, and it was difficult to find suitable timber for fencing and firewood. In country towns where a few years ago ample supplies of firewood could be obtained right at the doors of the housekeepers, it was now necessary to import coal for the domestic fires. This was a serious matter, but was only of minor importance compared with the extinction of birds, which had naturally followed the loss of their homes. Trees also provided a resting place for the birds, shelter from the storms and heat, and a sanctuary where safety might be obtained from enemies.

Without doubt the decrease in the bird population had added to the perplexities of producers. Birds had been their greatest friends, and now that many had entirely gone and the numbers of others greatly reduced, the insect and weed pests were rapidly becoming a great danger. A few months ago great hordes of grasshoppers spread over the country, devastating the grasses and crops in their flight. Although several months had elapsed the effect of this invasion was still apparent, and hungry emaciated sheep were vainly seeking for the little feed left by the pest. In the wheatgrowing districts of New South Wales, wheat-root grubs were becoming so great a menace that some farmers were seriously talking about abandoning their holdings.

''Where areas are big it is oftentimes impossible to check insect pests by artificial means such as spraying,'' Mr. McDonald continued. ''Their natural enemies must be relied upon, and it should be part of our agricultural policy to encourage the development of bird life. As homes for the birds are the first essential, there must be greater activity in the planting of trees, and these must be planted in such a way as to provide a suitable harbourage for our feathered friends.

The leaves which constantly fell to the ground were not blown away, but remained to form a mulch to enrich the soil and conserve the moisture. The thick growth made ideal shelter for birds, which also found food in the grubs and other insects that lived amongst the fallen leaves. Such coppices also give the best shelter for the farmers' livestock both in winter and in summer.

Another advantage of the grouping of trees was that very little expense was entailed in providing fencing to protect the young plants during their early years. No great difficulty should be experienced in finding space almost anywhere, as quite small coppices, of, say 20 feet wide and 50 feet upwards in length were very effective. Travellers in the country could not help but observe the examples of natural thickets and be struck by their beauty.

Many kinds of trees could be easily and cheaply raised from seed, which could be obtained at small cost. It was important that the trees selected should be hardy, quick growing, but long lived, and suited to the soil and climatic conditions. Too often attempts were made to grow trees of other countries such as oaks, planes, and others that were quite unsuited to the environment. Beautiful and useful native trees could be obtained for almost any locality.

PLATE 180.
IN THE JUNGLE, NEAR KURANDA, NORTH QUEENSLAND.

Plate 181.
A Glimpse of Lake Barrine, Atherton Tableland.

Answers to Correspondents.

BOTANY.

White Root.

A.J. (Buderim)—

The specimens represent the White Root (*Lobelia purpurascens*), a native plant, but one of the worst weeds, in some ways, we possess, and exceedingly difficult to eradicate. In some parts of Southern Queensland it is a particularly bad pest in pineapple plantations, and it is practically impossible to eradicate it. In your case, so far as we can see, the only plan would be to fork over the land in dry summer, and expose the white roots as much as possible to the hot drying sun. It might be possible to hasten their drying up by spraying the plants with a weak solution of salt. Any waste salt, such as butchers' salt, would suit this purpose. Arsenical solutions at weak strength might be tried to hasten the killing of the white roots, but great care is necessary to make certain that the solution is not strong enough to injure the standing trees. A leaflet on the weed has been posted to you.

Eumundi Plants Identified.

School Project Club (Eumundi)—

1. Leaves only, but seems to be *Paspalum conjugatum*, sour grass, or yellow grass—widely distributed over the warm regions of the world, and believed to be a native of America. It is a very undesirable grass, and should be eradicated if possible. Seed heads required to be certain of the identification.
2. Leaves only, but seems to be *Axonopus compressus*, the broad-leaved carpet grass, a native of tropical America, now widely spread over the tropical and subtropical regions of the world. In Queensland it is generally regarded as a pest except on inferior sandy lands where better grasses will not thrive. In America it is looked upon as quite a good fodder. Seed-heads are required to be sure of the identification.
3. *Paspalum dilatatum*. The common *Paspalum* grass of Eastern Australia. It is a native of South America, and since its introduction into Australia has become the chief dairy pasture grass of the coastal districts.
4. *Juncus* sp. A rush. Flowers required for identification.
5. A grass. Impossible to identify in the absence of seed heads.
6. *Digitaria didactyla*. Blue couch—a native of Queensland, very widely used as a lawn grass.
7. *Cynodon dactylon*. Common couch or Indian couch—a native of the warmer regions of the old world. It was originally described from Southern Europe. In Queensland it is sometimes used as a lawn grass, and it is also a good fodder, although its low growing habit is a disadvantage. In America it is known as Bermuda grass.
8. *Poa annua*. English meadow grass—a native of Europe, now naturalised in Australia, and very common in the winter and early spring months.
9. *Eleusine indica*. Crowsfoot grass—a native of the warm regions of the old world, common in Queensland as a weed in backyards, along roadsides, etc. Stock eat it readily at times, and its food value is high. However, it contains a prussic-acid-yielding glucoside, and if eaten in quantity by hungry stock would probably cause trouble.
10. *Sporobolus elongatus*. Rat's tail grass—a native grass common in Eastern Australia, and usually regarded as useless. The seed heads of your specimens are badly infested by a fungus disease.
11. *Gahnia aspera*. Not a grass but a sedge—it is a native plant, and seems to be of little value.
12. *Imperata cylindrica* variety *Koenigii*—bladey grass. A native grass common in open forest country, and frequently invading cultivation paddocks, where it becomes a great pest.

Trees for the Roma District.

C.C. (Roma)—

When in Roma last we noticed a number of bottle trees in some of the streets, and they appeared to be doing well. As you say, they transplant very readily. We are sorry that you have not had better luck with other native species. We feel inclined to vary the bottle trees with kurrajongs, and for this purpose we think it would be best to secure a half or a quarter of a pound of seed. The seed germinates fairly readily, and if sown in flats or in proper seed-beds would transplant quite readily.

Regarding Portuguese elm (*Celtis sinensis*), this tree is not usually stocked by nurserymen. It is a tree that should grow well in Western Queensland. Last time we were in Dalby we saw a few young trees. Perhaps you could obtain trees or probably young plants through the Brisbane City Council.

The *Bauhinia hookeri*, the Queensland ebony. This does rather well about Roma, and is well worth planting. The Brisbane City Council had a number of these trees at their Hamilton nursery.

Bella somba (*Phytolacca dioica*). We remember seeing a beautiful specimen of this a few miles out of Roma. The great objection to this as a street tree is derived from its very gouty stem, and we do not think it is very suitable for street planting.

Jacaranda, camphor laurel, silky oak, and citron gums should all do well, and should be obtained through the ordinary commercial channels.

Flindersia australis. Crows' ash. One of the most favourable trees for street planting. You may be able to obtain supplies from the Brisbane City Council, or from the Queensland Forestry Service, Lands Department.

Calodendrom capense, Cape Chestnut. A beautiful flowering tree that should, we think, do well at Roma.

Nephelium tomentosum. This tree should do well at Roma. Young plants may be obtained from the Brisbane City Council.

Regarding pines, various kinds would do well. Probably the insignis pine (*Pinus radiata*) would be well worth growing. It can generally be obtained from most nurserymen. Cypress pines should do well also at Roma. One of the best for general street planting in your district would be *Cyperus torulosa*, the Torulosa pine. Both seedlings and plants are available. The latter are more expensive, but are of a more uniform character. This pine has been used extensively for street planting about Toowoomba. Some of the Cypress pines do very well, particularly the rock Cypress. They are disliked by some people because they present rather a sombre appearance.

Poisonous Plants—Hoya Vine; Peach-leaved Poison Bush.

E.A.B. (Dangore, via Kingaroy).—Your specimens have been determined as follows:—

The plant with the fleshy leaf is the hoya vine or wax flower (*Hoya australis*), a very common climber in the scrubs of some parts of South-eastern Queensland. The plant is definitely poisonous, and has been responsible for trouble on several occasions. We think there is no doubt that if a poisonous plant is responsible in your case, this is the one. Experimental feeding with guinea pigs has shown that they develop symptoms of paralysis on the second day of feeding, and the general experience with cattle is that after feeding on this plant they go in the hindquarters. Some stockowners have found that drenching with Epsom salts saves animals. The following remedy has been recommended by one of the departmental veterinary Surgeons:—One lb. of Epsom salts and 1 lb. of treacle given as soon as the animal is noticed to be sick. This mixture should be followed daily with two drachms of potassium iodide dissolved in half-a-pint of water.

The plant with the smaller leaf is the peach-leaved poison bush (*Trema aspera*). It has an evil reputation among stockowners, though we have known many cases of ordinary paddock stock browsing on badly infested peach country and eating the peach in large quantities without any ill effects whatever. At times, however, it develops a prussic-acid-yielding glucoside. The occurrence of the glucoside is sporadic, it is only present for a short time, and what controls its formation in the plant is at present unknown. If the plant is eaten in large quantities by hungry stock when this glucoside is present, no doubt trouble will ensue.

Goondiwindi Specimens Identified.

W.D. (Goondiwindi)—

1. *Geijera parviflora,* wilga.

2. *Geijera parviflora,* wilga growing on black soil. This is tree wilga. The large plant is generally regarded as the better fodder. Wilga is a plant with a very mixed reputation. It is generally thought that soil has much to do with its palatability, but in other areas is has been reported that sheep will eat some and reject others. This is probably due to a difference in the flavour of the leaves on account of the presence of an essential oil of rather varying character. Most sheep seem to prefer wilga when it is cut and more or less withered.

3. *Acacia harpopylla,* young brigalow shoots. This, like other acacias and wattles, is a legume, and the food value to sheep should be fairly high. We think, when old, like No. 6, it tends to become rather harsh, and contains a lot of indigestible fibrous matter.

4. *Acacia* sp. Wonga. We shall have to wait for flowering material to be sure of the species. If sheep are eating it with relish we think it should be a good fodder. Like other allied plants, including mulga, it will, of course, cause congestion according to the amount of fibrous matter it contains.

5. *Atriplex semibaccata,* creeping saltbush, and another very imperfect specimen which looks like *Rhagodia hastata.* We are very interested in the account of these saltbushes. Both are generally regarded as quite good fodder, particularly the first. As a matter of fact, it is generally listed by some seedmen, and is imported by many people for growing on their properties. It seems strange that the sheep do not eat it, unless cut. It is generally eaten when it is half dry in preference to when it is very succulent, or when it is extremely dry.

6. *Acacia harpophylla.* See notes on No. 3; food value is not so high. We should say that it contains rather much fibrous indigestible matter present in the leaves and foliage to be of much value.

7. *Rhagodia spinescens*—a shrubby saltbush for which we have not heard a common name.

"Wild Gooseberry."

J.J.McL. (Brisbane)—

The specimen collected at Atherton represents *Nicandra physaloides,* commonly called wild gooseberry or poisonous gooseberry. The plant is very closely allied to the Cape gooseberry, and regarded as mildly poisonous. It is quite a common weed in parts of Queensland, but we cannot say that we have seen stock eat it, at least to any great extent. We should say that its use as green feed for fowls, particularly young chickens, would be risky.

Ochrosia Nicker Bean. Pittosporum.

B.M.J. (Magnetic Island)—

1. *Ochrosia elliptica,* the Ochrosia plum. We have not heard of a local name for this plant, and recommend the use of the generic name, which is fairly short and euphonious. The red fruits we should say from information received are poisonous, and the plant belongs to a poisonous family. The plant is fairly common on Queensland beaches.

2. Very small, but we would say *Caesal piniacrista,* nicker bean. A very common plant of prickly, scrambly growth, mostly found behind mangroves. The seeds are round and pearly-grey in colour. They are rather large, and are often used for necklaces, &c.

3. *Pittosporum ferrugineum.* We have not heard of a local name for this plant, but many call it pittosporum, and this name is now generally used by many gardeners, especially as one or two of the species are common in cultivation.

Free-flowering Clerodendron.

"Sap" (Townsville)—

Your specimen represents *Clerodendrom floribundum*, a native tree fairly widely distributed over Queensland. The flowers are tubular and white, and are succeeded by the black fruits held in red enlarged calyx. Whether in flower or fruit this tree is rather a handsome one and worth cultivating. It is sometimes seen in Queensland gardens. We have not heard of a local name given to it, but if you wish to coin one you may call it the *free-flowering clerodendrom.*

Blackall Range Plants Identified.

T.H.B. (Curramore, Maleny)—

1. *Cassia bicapsularis.* A native of tropical America, now widely cultivated in most tropical and subtropical countries.
2. *Campenula* sp. A kind of bluebell.
3. *Asclepias curassavia.* Red head or milky cotton bush. A weed common in parts of Queensland. At various times it has been accused of poisoning stock in Queensland.
4. *Oxalis variabilis.* This is not an Irish shamrock. There has been a considerable argument, even in Ireland itself, concerning the true identity of the shamrock, and different plants are still regarded by various people as being the true shamrock. Four different plants, viz., white Dutch clover (*Trifolium repens*), suckling clover (*Trifolium dubium*), black medick (*Medicago lupulina*), and wood sorrel (*Oxalis acetosella*) are still looked upon by various people as representing the Irish shamrock, and of these it seems that one of the first two is most likely to be the original plant mentioned in the tradition. White Dutch clover is the commonest clover we have in Queensland, and suckling clover recently appeared in many places. All the plants mentioned are common throughout the British Isles, and are by no means confined to Ireland. This information is taken from an article by C. Nicholson, in the "Gardener's Chronicle," of the 14th March, 1931. There the matter is discussed at some length.
5. *Cynoglossum amabile.* Chinese forget-me-not.
6. *Juncus communis.* The common rush.
7. *Viola hederacea.* Wild violet.
8. *Leucojum aestivum.* Summer snowflake. This is not the English snowdrop, but an allied plant. They are similar in general appearance.
9. *Salvia leucantha.*
10. *Hardenbergia monophylla.* A white flowered form of the common wild sarsaparilla.
11. *Iresine herbstii.*
12. *Dimorphotheca ecklonis.*
13. *Thuja orientalis.* Book cypress.
14. *Solanum pseudocapsicum.* Jerusalem cherry.
15. *Chrysanthemum frutescens.* Marguerite or Paris daisy.
16. Appears to be *Myosotis* sp., a species of forget-me-not. Complete plant required to be certain.

A Common Vetch.

H.W. (Miva)—

Your specimen represents *Vicia sativa* var. *segetalis*, a variety of the common *vetch.* This particular variety is a common form, which is naturalised in Queensland, but I have not heard a distinctive local name given to it. It is quite a good fodder, especially as it comes in at a time when usually speaking grass is rather short.

Some Native Trees.

Forestry Club (Rosedale, N.C. Line)—

1. Wattle. A name applied in Australia to any plant of the genus *Acacia*. The name is supposed to have risen from the fact that the twigs of an allied plant were used in the early days of New South Wales to make wattle and daub houses.

2. Blood Wood. There are several sorts of blood wood in Queensland, all belonging to the genus *Eucalyptus*. Common in your district is red blood-wood (*Eucalyptus corymbosa*). The timber is much prized for house stumps, but is not usually cut, due to the prevelance of gum veins. The name "blood wood" comes from the fact that the tree when cut exudes a blood-like sap, which on drying turns quite hard. Such substances are named and known technically as *kinos*, and are much used in dyeing and tanning.

3. Iron Bark. There are several sorts of iron bark in Queensland. They all belong to the genus *Eucalyptus*, and are all prized for heavy building purposes, where strength and durability are required.

4. Mahogany. A name applied indiscriminately in Queensland to a number of different trees. One of the commonest in your district is Swamp Mahogany (*Tristania suaveolens*), a timber most favoured for wharf piles, because of its resistence to the attacks of the marine borer.

5. Stringy Bark. There are several sorts of stringy bark, such as the yellow stringy bark, the white stringy bark, &c. These all belong to the genus *Eucalyptus*, and are much used in general building.

6. Oak. There are several kinds of oaks. They are distinguished by the type of country in which they grow such as desert oak, swamp oak, &c. They all belong to the genus *Casuarina*. One of the commonest in your district is rose oak (*Casuarina torulosa*). They are greatly prized for firewood. Some of them are utilised for different purposes, and used to a limited extent.

7. Box tree. The common box of your district is the brush box or scrub box (*Tristania conferia*). This timber is much cut in New South Wales, but is not cut here to any great extent as yet, due to its tendency to warp unless carefully seasoned.

8. Moreton Bay Ash. This is a Eucalypt (*Eucalyptus tessellaris*).

9. Tea-tree. The correct spelling of this tree is "Tea-tree" not "Ti-tree." The origin of the name is, that leaves of one of the species were used by a surgeon on Cook's third voyage as a substitute for ordinary tea. The beverage was found useful in keeping down scurvy. The leaves of the tea-tree vary in composition, but some contain a valuable essential oil. There are several sorts of tea-tree in your district, and most of them belong to the genus *Melaleuca*.

   We strongly advise you to obtain for your school library a copy of the "Timber and Forest Products of Queensland," by E. H. F. Swain, obtainable from the Government Printer, Brisbane, or the Sub-Department of Forestry. Price, 6s. 6d, post free.

A Pond Weed.

Inquirer (Brisbane)—

The specimen represents *Potamogeton pectinatus*, a species of pond-weed, sometimes called fennel-leaved pond-weed, a native of Australia, but like many aquatic plants widely spread over the temperate regions of the world. This is the first time we have had this plant reported as a pest. As a matter of fact it has been reported from only one location on the Darling Downs. The plant seen at Murweh is, we think, a different plant, a species of Chara or stone-wort, which we have had from that location on one or two occasions as causing serious trouble in the bore drains. Regarding the eradication of the pond-weed or *Potamogeton*, we have little experience to guide us. In the countries where it is a pest the usual procedure is for men to walk along the bank with a weighted cutting instrument and cut the plants off above the surface of the mud. This is, as far we know, the only control known. The plant is not known to be poisonous or harmful in any way. I am rather inclined to think the plant will die out at the approach of hot weather, but on this point I am not at all sure.

General Notes.

Staff Changes and Appointments.

Messrs. H. N. Lund and D. Dignam, Tully, have been appointed honorary rangers under the Animals and Birds Acts.

Acting Sergeant S. D. Kreutzer, of Harrisville, has been appointed an Inspector of Slaughter-houses.

Mr. A. V. C. Smith, Clerk of Petty Sessions, Mackay, has been appointed Chairman of the North Eton, Racecourse and Cattle Creek Local Sugar Cane Prices Boards, vice Mr. T. E. Dwyer, transferred.

Messrs. K. R. Hack (Nerang) and Malcolm Buchanan (Goomboorian, via Gympie), have been appointed growers' representatives on the Banana Industry Protection Board until the 30th September, 1936.

Mr. A. G. Muller, manager, Yanko Station, via Thargomindah, has been appointed an honorary Inspector of Stock, vice Mr. Chas. Dorrell, resigned.

Mr. A. J. Everist, Private Secretary to the Secretary for Agriculture and Stock, has been appointed Librarian and Registrar of Co-operative Agricultural Associations, Chief Office, Department of Agriculture and Stock.

Messrs. R. Nott and K. S. McIntosh, Government Veterinary Surgeons, Department of Agriculture and Stock, have been transferred from Rockhampton to Blackall, and from the Animal Health Station, Yeerongpilly, to Rockhampton, respectively.

Mr. T. D. Cullen has been appointed Cane Tester at the Fairymead Sugar Mill for the currency of the sugar season.

Mr. D. A. Logan, Inspector of Stock, Rockhampton, has been appointed a District Inspector of Stock.

Mr. E. McKeown, National Parks Ranger, Tully, and Mr. R. P. Dare, Southport, have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act.

An area of about 2,540 acres adjacent to Goorganga Homestead, Proserpine (comprising portions 2v and 379 and part of Goorganga Creek, County of Herbert, Parish of Bonaventura), has been declared a sanctuary under the Animals and Bird Acts, and Mr. E. G. Lascelles, the manager of Goorganga Station, has been appointed an honorary ranger under these Acts for the protection of the sanctuary.

Mr. F. P. C. Bell, Inspector under the Fertilizers, Pure Seeds, and Stock Foods Acts, Department of Agriculture and Stock, has been appointed also Inspector under the Pest Destroyers and Veterinary Medicines Acts.

The Officer in Charge of Police, Laura, has been appointed also an Inspector under the Brands Acts.

Mr. W. A. Kearney, Inspector under the Stock, Slaughtering, and Dairy Produce Acts, has been transferred from Cloncurry to Mount Isa.

Cream Regulations.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock), in referring to the new Regulation which came into operation on 1st September, governing preferential payment for cream, pointed out that there seemed to be some misapprehension regarding its interpretation.

This Regulation prescribes definitely preferential rates of one halfpenny for "choice" over first-grade cream, and one penny less for "seconds" than first-grade cream.

As the difference in preferential rates of payment for the grades have been taken in some quarters as a minimum, Mr. Bulcock, in order that there should be no misunderstanding, emphasised the fact that these rates are fixed and cannot be varied whilst the Regulation is in force, but he further stated that the new order does not affect cream which may be graded below second grade, as in this case factories may make a further reduction if they so desire.

The Minister called attention to the fact that this Regulation gives effect to the wishes of the dairying industry, as expressed in conference.

Duck Season Closed.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock), in referring recently to the protective provisions of the Animals and Birds Acts relating to the wild duck, pointed out for the benefit of those interested that the variation of the open season last year in Southern Queensland would not apply during the present year, as it was proposed to revert to the scheduled dates of protection included in the original Order in Council issued on the 27th March, 1930.

Following this decision, the open season in respect of the wild duck in the Southern portion of the State expired at midnight on the 30th September, when protection will apply automatically in that area for a period of seven months, as prescribed in the Order in Council.

Shire of Cleveland a Sanctuary.

An Order in Council has been issued in pursuance of the provisions of the Animals and Birds Acts, declaring the Shire of Cleveland to be a sanctuary for the protection of native animals and birds.

Stanthorpe Fruit Statistics.

A Regulation has been issued in pursuance of the provisions of the Fruit Marketing Organisation Acts, providing that every fruitgrower growing fruit for market in the Granite Belt district shall furnish to the Committee of Direction of Fruit Marketing on or before the 30th November in each year, a return in the prescribed form, containing all the information and particulars mentioned or referred to in such form.

The necessary forms will be supplied to growers by the Committee of Direction.

Cotton Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Cotton Board by providing for certain alterations in the boundaries of the cotton districts.

The definition of a grower has been amended to provide that the class of persons who shall be eligible to vote on any referendum or election shall be persons who have during the twelve months preceding the referendum or election, delivered to ginneries seed cotton which was grown by them on land of which they were owners or tenants, or who, during such preceding twelve months, have furnished a cotton return to the Board showing such owner or tenant to be a bona fide cotton grower.

Fairymead Mill Levy.

Regulations Nos. 464 and 465 have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Fairymead Mill Suppliers' Committee to make a particular levy at the rate of one penny (1d.) per ton on all sugar-cane supplied to the Fairymead Mill during the current season, the amount of the levy to be used for the purpose of defraying the costs of employing a farmers' representative at the mill during the season. Any petition to the Minister requesting a poll to be held on the question of whether or not the levy shall be made must be signed by at least 50 per cent. of the cane suppliers to the Fairymead Mill, and must reach the Minister on or before the 21st October, 1935.

Hail Insurance Compensation.

The State Wheat Board hail insurance scheme Regulations have been amended to provide that growers' returns for the purposes of hail insurance compensation must be lodged with the Wheat Board on or before such day not later than the 30th September in the year in which the crop is grown as the Board may determine. The form of the return to be tendered by growers wishing to be eligible to receive compensation in case of damage to their crops by hail has also been altered, so that growers must now show the number of acres under each variety and the estimated yield of each variety per acre on appearances at the time of making the return, as well as a description giving the number of the portion, the name of the parish and the name of the county of the land in question.

Murwillumbah Show.

The Secretary of the Tweed River Agricultural Society (Mr. J. L. Banner) has informed us that the annual show of his society will be held at Murwillumbah on 27th and 28th of November next.

Rural Topics.

More and Better Stock by Permanent Pastures.

A strong case for pasture improvement was presented by Mr. L. Freebody, of Adaminaby, at the recent South Coast and Monaro District conference of the New South Wales Agricultural Bureau. They had grown up, said the speaker, in a land which had been bountifully blessed by nature, and which had been sufficiently fertile in the past to enable them to make good profits with very little effort in the way of adding to, or increasing, the natural production. This state of affairs could not last for ever, and with closer settlement and the desire to make up, as far as possible, for lower prices by increased production from the same area of land, overstocking had taken place, with the result that many landowners to-day were expressing the opinion that the carrying capacity of their natural pastures was not the same as it used to be, and also that the health of the animals on these pastures was not so good.

To him, said Mr. Freebody, the remedy seemed simple—it consisted in the laying down of permanent pastures. As evidence of the benefit of this procedure he quoted the following actual results obtained by him from improved pastures since he had started in 1922:

In that year the property comprised 5,087 acres and carried 60 cattle and 2,500 sheep, producing 58 bales of wool. Since then, 1,870 acres had been sold, leaving an area of 3,217 acres, and it now carried 140 cattle, and 4,000 sheep, producing 110 bales of wool. This despite the fact that actually less than one-third of the property had yet been treated. He hoped, said the speaker, to have the safe carrying capacity of the property up to 5,000 sheep in two or three years. Before improvement this country was ordinary granite hill country, fairly heavily timbered, and was possibly capable of carrying a half sheep or little better to the acre. Since improvement, the weight of wool per head had very materially increased.

Points in Pasture Management.

Proper management is imperative if the full benefit is to be obtained from money spent on pasture improvement. If pasture mixtures sown in the autumn have made normal headway, vigorous growth will be made in the spring, during which period stocking should be regulated to control the seeding of the various species as desired.

Sown pastures may be stocked as soon as the plants have made sufficient root growth to withstand grazing, and it is preferable to commence by turning in a fairly large number of stock and leaving them in the paddock for a short time only; they must be removed as soon as the growth is shortened back. Regulated grazing in the early stages encourages the plants to stool out and make stronger growth. Stock should not be turned on to young grasses and clovers if the weather is wet and the ground boggy and soft, for the tramping under these conditions will kill out many of the plants. When the land settles down and becomes firm, the liability of plant damage from this cause is reduced. As the plants develop, the stocking periods can be lengthened until eventually normal grazing can be carried out, which, however, should be rotational.

During the early grazing periods it is advisable to observe closely the grazing behaviour of the stock, and in the event of their paying too much attention to comparatively slow growers such as *Phalaris tuberosa*, they should be removed for a time.—''Agricultural and Pastoral Notes,'' N.S.W. Department of Agriculture.

Washing Dairy Utensils—Boiling Water Essential.

Boiling water is absolutely necessary in dairy work to ensure cleanliness, and there should be no sparing of it. It is well, however, not to start washing the utensils with water that is boiling, for this very high temperature has a tendency to cause the albumen to coagulate, and to stick to the utensil in a thin, often invisible, film that supplies a breeding ground for bacteria. The utensils should first be washed with warm water, with a little washing soda or other alkali added, using good brushware (cloths being very objectionable), after which they should be scalded in ample boiling water, and then put in a clean place to dry.

Points in Dairy Farm Management.

''Himi,'' a well-known writer on rural topics, discussing points in dairy farm management in the ''New Zealand Farmer'' for July, has this to say:—

''Improvement, and still more improvement'' in the quality of New Zealand's dairy products is a slogan that might well be adopted, with a view to meeting the world-wide competition which threatens to become more pressing with each succeeding year. Notwithstanding all the advances that have been made in the hygienics of the farms and factories, and the progress towards the perfection of the chemical and manufacturing processes, there still remains much to be done. Take the elimination of unpleasant feed flavours from butter, as one instance amongst many. This trouble has been a fruitful source of discussion between factory suppliers and factory managers for many years. As a result of these conversations, and of experiments, it is now very widely known that if taint-producing feeds such as turnips, cabbage, and green lucerne are fed shortly prior to milking time bad feed flavours develop; whereas if these are fed immediately after milking little or no taint is observed at the following milking. Simple discoveries such as this have enabled the farmer to safely use the most profit-producing foodstuffs, and have added to our knowledge of what constitutes good farming practice.

During recent months farmers in the Waikato appear to have become increasingly definite in their opinion that proper pasture and herd management may succeed in lessening strong feed flavours where, for example, clovers may be dominant. Mr. E. Bruce Levy, agrostologist of the Department of Agriculture (N.Z.), made an inquiry into the Waikato difficulties. His conclusion is that an examination of the morning cream compared with the night cream from the same herd and shed, and often from the same pastures, clearly indicated that ''there is something in farm management.'' Comparisons between night and morning milk consistently showed that the night cream is often strongly feedy, and the morning cream is comparatively mild. There is no material increase in feed flavour intensity with ageing of the cream. The fact that morning cream was less feedy than night cream did not support the opinion that enzymes or ferments were responsible for feed flavour—if it is correct that at night the plant tissues contain large amounts of these ferments, and during the day the ferments are practically absent. Mr. Levy's theory is that the difference between night and morning milk is largely influenced by the grazing habit of the cow at night, as compared with day, in relation to the amount consumed, and the nearness or otherwise to milking time that food is eaten.

Observations have shown that there is comparatively little grazing done between midnight and milking time in the morning, and this, it is said, may have an important significance when coupled with the mild feed flavour of the morning's cream. ''This brings up the question,'' said Mr. Levy, ''whether it would be possible to manage the dairy herd in such a way that the luscious early spring growth is rationed, so that a herd is off it and on non-luscious feed four to five hours prior to milking time in the evening.'' A common practice amongst farmers is to put their cows on the best paddocks by day, whilst their night paddocks may merely contain harder feed, with or without hay or ensilage. This practice probably developed from the original idea that cows don't graze much at night, and in the daytime the farmers liked to see them on the best feed, anyway. From the fact that there is very little grazing done between midnight and morning milking, Mr. Levy advances the idea that the dairy herd automatically rations itself at night, and therefore suggests the use of the early luscious pasture as night grazing, rather than as day grazing, as at present. In this way it is hoped to avoid feed flavours. The soundness of the theory may or may not stand practical tests. Cattle, after all, are very natural creatures. After feeding all day on bush pasture they will, after the evening's milking, consume a fair quantity of comparative roughage. But when they discovered, as they probably would after a few days, that night time was to be their rich feeding time, there might be no ''automatic self-rationing,'' as is observed at present, and vaster quantities of luscious grasses might be taken to offset the less palatable feed they had in the daytime. However, Mr. Levy is not dogmatic, and it is within the province of all farmers troubled with feed-flavoured milk to give his suggestion an earnest trial.

It is interesting to note that clovery pastures are essentially worse in causing feed flavours than grassy pastures. That, of course, is not intended as an indictment of clover, but as an additional pointer to the need for better farm management. The practice of keeping the sward short tends to encourage clover rather than grass and to produce greater quantities of young, vigorously-growing leaf rich in protein, and these two factors appear to intensify feed flavours. The hardening of the pasture and the consequent ageing of the leafage appears entirely to correct feed flavours.

Trials have shown that feediness is governed by weather conditions. Unless the weather is such as to promote rapid growth, particularly in clovers, no feediness should be apparent from herbage grazing. Young, fresh, quick-growing growth, particularly in clovers, is held to be largely responsible for feediness. Once the plant ages, or is fed in conjunction with more hardened feeds, feediness declines. Getting back to Mr. Levy's suggestion, rotational grazing—that is, giving the cows four six-hour shifts instead of two twelve-hour shifts (representing day and night grazing)—appears to be simple enough. After all, the practice would only have to be observed at certain times of the season.

Strictness Required in Cream-Grading.

Dairying is much the same the world over, especially when it comes to payment for quality problem. The man who is prepared to do things well in the aim to produce a high-quality milk or cream is not being encouraged to the extent he should be encouraged. Many a man has slackened off in his efforts to do the right thing when he finds neighbours who have poor equipment and have no appreciation of cleanliness getting the same price for their product that he gets. The one thing to force the indifferent to improve their methods and to encourage those who are producing a high-quality raw material is a more strict system of grading. And this will never be brought about while the keen competition for supply between different factories continues, not only between proprietary and co-operative companies, but even between co-operative concerns, and this at times to such an extent that it makes one wonder if the spirit of co-operation actually exists. The trouble is not common to this country (N.Z.). Apparently, judging by the report of a Sydney dairying conference, the "incorrect and lenient grading of cream" at some factories is just as prevalent in Australia as it is in New Zealand. The policy, declared a speaker at the conference, led to disappointed suppliers at one factory, whose cream had been correctly and conscientiously graded down, taking it to another factory where they could obtain choicest grade because of the policy of the factory. This speaker said, and very rightly, that there should be a much bigger difference between the price paid for choicest and second grade.—"Taranaki Herald" (N.Z.).

The Sow's Capacity for Milk.

A bad milking sow is worse than no sow at all, because she loses money instead of gaining it. It has recently been shown that by drawing milk from one or more teats, when the young pigs are feeding from their dam, the approximate yield can be ascertained, but a good deal of patience and experience is needed to succeed in this procedure. The pigs feed several times daily, and the milk is not let down until they do feed. The milk, too, falls off in quantity from week to week after the fourth week, until in the eighth week or slightly before weaning the quantity produced is not much more than one-half the yield of the fourth week. A sow may produce up to 11½ lb. in a day during the fourth week, and as little as 3½ lb., and, therefore, it is not difficult to see how impossible it is to expect well-grown youngsters where the dam is an inferior milker.—"The New Zealand Farmer."

Shade for Pigs.

During the summer adequate shade for pigs is essential. The ordinary sty, especially if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If no trees are present, a wooden shed will answer the purpose. Another important aid to the health and comfort of pigs is a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling himself, and if the pig-yards have a frontage to a stream, well and good, though there is an objection to pigs wallowing in a stream, in so far that infection may be carried down from diseased pigs higher up the stream, and as a result contagion spread over a wide area. Unfortunately, the hog wallow usually seen on the pig farm consists of a filthy puddle-hole, into which drains all the excrement from the yards, and in the foul mud of this, the only wet spot available, the pigs are compelled to seek relief. If there is infection of any kind in the yard, it is to be found in just this place. Such wallows should be drained and filled in, and if there is no naturally clean place for the pigs to lie in, a concrete or similar bath should be built. This can then be kept clean, and the liability to infection from contagious disease will be diminished. Comfortable and hygienic conditions are most important in maintaining the health and wellbeing of pigs.

The Biological Balance—Place of Predatory Birds in Rural Economy.

The secretary of the Royal Zoological Society of New South Wales, Mr. A. F. Basset Hull, has issued a warning against interference with the balance of nature. He said that full consideration should be given to the possible costly effects before any group of birds or animals was declared a nuisance.

According to a report from Darwin, he continued, thousands of hawks were to be seen feeding on grasshoppers and insects. Mr. Ion Idriess, the well known author, had recently stated that "countless millions of rats" were infesting the interior, and that the swarms were followed by legions of wild "domestic" cats; further, that sand was drifting in growing quantities from the interior into Queensland and New South Wales. Mr. A. S. Le Souef, curator of Taronga Park, Sydney, had claimed that the spread of the mistletoe—a parasite on trees—was due to the destruction of opossums and koalas, which ate the seeds.

Those items, said Mr. Basset Hull, revealed the damage that was caused by upsetting the condition known as the "biological balance" or the dependence of one creature upon another, in which, normally, one was checked in its spread by the other. The practice of destroying hawks of all kinds had led to an increase in both insects and rats; but particularly rats, on which hawks preyed. Following the superabundance of rats was an increase in wild cats, which caused extensive destruction among useful insectivorous birds; consequently grasshoppers and other pests had ravaged pasture lands unchecked.

"It is a foolish thing to destroy birds which are considered to be pests before all the facts have been investigated. It will be found that suspected pests are 90 per cent. valuable, and that their destruction leads to greater damage and loss."

Great areas of sand-smothered country, Mr. Basset Hull said, were caused in many cases by over-stocking. Herbage was eaten, and rabbits and rats destroyed the roots of the plants, so that there was nothing to hold the soil. Eagles principally were rabbit-eaters, yet on many stations these birds were trapped extensively, because it was said that they occasionally took lambs.

Opinions on the question of extending protection to crows and hawks differ considerably, however. Commenting on the recommendation of the Royal Zoological Society to protect or partially protect certain birds, including crows and hawks, Mr. W. T. Merriman, of the Yass District (N.S.W.) Pastures Protection Board, had this to say (as reported in the "Sydney Morning Herald," 15th August) at the last meeting of that body:—Mr. Merriman said that after an experience extending over fifty years on the land in districts where crows had been prevalent, and sometimes very numerous, there was no other conclusion he could come to than that crows were despicably cruel birds, and the losses sustained by men on the land through their depredations were very considerable. If allowed to multiply, the losses from their attacks would increase tenfold, as he knew from experience years ago when they were plentiful. Admittedly they might destroy a certain amount of insect life when other food was scarce, but again that they must weigh in the balance the thousands of other much more valuable insectivorous birds of which the crows killed the young and destroyed the eggs during the breeding season. Among the many birds killed by crows were magpies, and he considered the black magpie was one of the greatest agents he knew of for destroying maggots in the chrysalis stage. In his opinion, crows, hawks, and foxes were the chief agents in destroying their very valuable harmless insectivorous birds, which had always been a friend to the man on the land. But these were becoming more and more scarce because the crows, hawks, and foxes during the breeding season were continually destroying the eggs and killing their young. The crow was also very destructive on maize crops when the grain in the cob was soft. They were a menace in the orchard—particularly the cherry orchard. They attacked the crop every year, and he estimated a crow would eat and destroy over a pound of cherries a day. The crow was a terrible pest in the poultry yard by stealing numerous eggs and killing chickens. In drought times crows inflicted terrible losses on weak sheep. He well remembered in the great drought of 1902, when crows were very plentiful, they lost 3,000 sheep on their property. This was largely due to crows, which picked the eyes out of the sheep when they were unable to get up, and then it was impossible to save them, as they died in a few days from blood poisoning, caused by the poisoned beak of the crow. During lambing time crows destroyed a great many lambs. He estimated that they killed at least 5 to 10 per cent.

Continuing, Mr. Merriman said he had repeatedly found one eye and sometimes both eyes picked out of the lambs, and quite often the tongue, before the ewe had completely given birth to her young. He had seen mobs of crows attacking lambs

two to three weeks old with their mothers. In his opinion, if they destroyed the crows, hawks, and foxes, then their valuable birds would breed up again and preserve the balance of nature. It was said the crow was a scavenger, but they were largely responsible for the carcases they were supposed to destroy. The crow was the means of encouraging blow flies by killing sheep and lambs for flies to breed in. Anyone who advocated their protection, concluded the speaker, was penny wise and pound foolish.

The board decided unanimously to protest against any protection of crows and hawks. It also endorsed Mr. W. Merriman's views.

Artificial Insemination of Stock.

Experiences in Russia recall ideas expressed in this country (Great Britain) more than twenty years ago, when the question of importation from Holland was first discussed. Such ideas centred around the possibilities of artificial insemination should direct importation be impractical. The possibilities may again have to be seriously considered.

During the year 1931, 187,000 cows in Russia were treated by insemination. It is said that as many as 400 cows can be inseminated by a single service of a bull. As many as 1,250 cows have been inseminated from one bull in the course of a year. By means of a special process, raw sperm can be stored for eighteen days, and then used with success. The insemination of ewes in Russia seems to have been very successful, as about 90 per cent. of the animals became pregnant. One service of the ram gave, on the average, enough sperm to inseminate six ewes.—The "British Friesian Journal."

Healthy Calves.

In order to produce healthy, thriving calves, we must have in the first place healthy parents, but healthy parents will not insure healthy calves if we do not treat them liberally in the matter of suitable food, and with general good care. It would be very interesting to know the history of all the world's greatest butterfat producers—namely, how they were treated from birth until they reached their first lactation period. It may be pretty safely concluded that one of them ever knew what it meant to be short of good food. It may be pointed out that an indifferently reared calf has sometimes turned out a great milker; but how much greater would she have been had she known very liberal treatment in her younger days?

Calf-feeding is work that requires the closest attention on the part of the attendant, yet it is work that is often done anyhow by anyone. Regularity of feeding and clean drinking pails are two essentials that are too often ignored. Some breeders advocate feeding the calves three or four times daily, and although this plan approaches closer to Nature than the twice-a-day system, I do not consider it necessary. I have generally had good—shall I call it luck—in calf-rearing, and I never fed the calves oftener than twice a day.—Primrose McConnell in the "New Zealand Farmer."

South African Wool.

Mr. J. S. McNab, the well-known Australian sheep classer, who visited South Africa recently, states that merino breeders in South Africa have swung away from masculine sires, and he found the wools are becoming shorter, more wasty in appearance, and the sheep are showing too much fold development. To some extent the benefit of the splendid sires imported from Australia between 1915 and 1924, has been lost. Some breeders known to Mr. McNab would not use certain of the progeny of the imported sires, but preferred the meat, "pretty woolled" sires, and the result has been that flocks have become too tight in the wool, sometimes over wrinkly, smaller in frame, and lacking in constitution. Mr. McNab was one of the first Australian sheep and wool experts to be employed in South Africa before the war. When engaged as expert, he warned sheep farmers that the natural conditions of the country tended to make the wool of merino sheep tone down greatly, become wasty in fibre, and of low yielding capacity. To counteract these tendencies, he advised the use of bold medium quality sires with plenty of body and elasticity in the wool, and it was acknowledged that the subsequent improvement in the South African clip was brought about largely by the general acceptance of that advice, but the improved standard has not been maintained, because less masculine and finer quality woolled sires have been used too freely of late.—"The Australasian."

Stock Losses in America.

Stock losses caused by drought conditions in the United States have been heavy, according to the "American Cattle Producer." Most of the cattle losses occurred in the western States. The Bureau of Agricultural Economics estimates that cattle numbers have been reduced by about 7,600,000 head, which means that three-fourths of the increase from the low point of the production cycle in 1928 has been eliminated within a single year. Sheep numbers also were reduced in 1934, and, as was the case with cattle, the reduction occurred principally in the western States and in the areas of the corn belt, where the drought was most severe. The reduction in sheep numbers has been officially estimated at about 2,600,000 head for the country as a whole. Hay supplies, which usually provide more than half the meal produced in the United States, have been curtailed greatly, too. The 1934 pig crop was about 35 per cent. smaller than the crop of 1933, and a further decrease is expected this year. The pig numbers on farms in the United States on 1st January, 1934, totalled about 57,000,000 head. On 1st January this year the numbers were estimated at 37,000,000 head.

Points of a Clydesdale Stallion—A Breeder's Views.

Addressing a Farmers' Club in Banffshire, Mr. George W. Cowie, who is a well-known Clydesdale breeder, said that no man should have the presumption to go into a judging ring unless he was prepared to give reasons for his decision. He was going to give what, in his opinion, went to the making of a good horse, and he was to limit his remarks to the Clydesdale breed because, after all, there was a differense between breeds of draught horses. He also considered the Clydesdale for quality of bone, muscular development and action, when these things were attended to, to be the best horse, perhaps, in the world.

In looking for a good breeding stallion the first thing that should be found, as indeed it should be in any male of any breed of horse or cattle or sheep, was a masculine appearance, which would be found in its head or crest. The neck should have a nice quick arch and the head should be attached to the crest so that one had a feeling that it was in proportion and not too big or too little. It should be fairly wide at the nostrils and between the eyes and should have a nice flashing eye. That indicated that the horse had grit, stamina, and a good constitution, and it should carry that head proudly.

He did not think any better test could be applied, with regard to the body of a horse being in good proportion, than to stand, say, about thirty yards from it and see if the horse appeared smaller at that distance than when it was close up. If it looked smaller they would invariably find that the horse was built in the right proportions. A good horse largely depended on its legs and feet because it was on its legs and feet that its working like depended. The hind legs were perhaps more important than the fore legs because they were used for pushing while the forelegs were used for pulling.

Another important thing, more important than many gave it credit for, was the quality of its hair. The hair of a good breeding stallion should be silky and straight. Most of these qualities held also so far as the mare was concerned and, in addition, the female should be low, long, and roomy. That did not mean really that her body should be long and spare, but her neck was usually a little longer than that of the male. The mare should also have a mild, motherly eye.

Another thing of importance was action. He would far rather have a horse, 16 cwt. in weight, with his legs rightly placed below his body, and with a nice, free, springy action than one which weighed 20 cwt. with his legs so placed that they walloped about everywhere when he ran, because the light horse would be sure to have a longer working life. The foot was one of the most delicate parts of the horse and the length of its working life often depended on the quality of the horn or hoof.—"The Farmers' Gazette" (Ireland).

A Mouseproof Hay Shed.

At comparatively little extra expense Mr. W. A. O'Neil, of Cowra (N.S.W.), has made his haysheds mouseproof. His method is to line the outside of the shed to about the height of the floor of a lorry with corrugated galvanised iron, the sheets being set upright in about 9 in. of concrete. No door being necessary, the iron sheets could be overlapped at the edges all round, thereby rendering the shed compeltely vermin-proof.

By keping the sides at the height of a lorry floor loading and unloading operations remain unhampered.

Fertility of Twin Lambs.

Discussing the question as to whether where twin lambs occur, one a male the other a female, the ewe will be fertile, in the "New Zealand Farmer" for August, "Himi," an able contributor to that journal, has this to say:—

Sir William Perry, of Masterton(N.Z.), who has had half a century's experience in sheep breeding, says he does not think the ewe's fertility is affected because she happened to be twinned with a ram lamb. It is rathr curious that this condition should vary in different classes of animals. In cattle, cows that are barren because of the fact that they were twin to a bull calf are known as free-martins. The bellow of a free-martin is similar to that of an ox, having more resemblance to that of a cow than that of a bull, and shows that the incapacity to breed, and all the other peculiarities, result from its having the generative organs of both sexes combined in a more or less imperfect state of development; in some the organs of the male predominate, in others those of the female. In many cases a heifer co-twin to a normal bull is normal in external appearance, but has no bulling periods. On an average one in every eight cases of twins (one a male, the other a female) results in the birth of a perfectly normal bull and an equally perfect heifer. This is due to the fact that in such cases fusion of the foetal membranes has not occurred.

Tree Planting in Country Towns—A Suggestion from South Africa.

Discussing plans for the Empire Exhibition in South Africa next year, the editor of "South African Country Life" describes a project for providing a great jacaranda avenue, and, incidentally, mentions a method of tree planting well worthy of the consideration of local authorities in Queensland. The editorial follows:—

Double avenues of jacaranda trees,, nearly half a mile in length, are to be one of the spectacular features of South Africa's Empire Exhibition next year.

Careful inquiries made by the authorities and a certain amount of botanical research have shown that the accomplishment of this scheme—providing a great jacaranda avenue, fully in flower, scarcely a year from the date of planting at Milner Park—which will be unique as a display not only in the Union, but also overseas, is practicable.

With the aid of modern scientific knowledge, the job will be done. Half-grown trees, about an inch and a half to two inches in diameter, will be brought from nurseries at Johannesburg and from the "Jacaranda Capital," Pretoria, whose fame on account of the blossoms has become world-wide.

The avenue is to lead from the main entrance to the Empire Road Extension, straight up the hill, to the mighty 200 ft. tower, which is to be the dominating feature of the buildings.

Lining both sides of the central roadway, which starts at the triumphal gate and leads off in other lanes towards the various industrial, governmental and municipal palaces, "Jacaranda Avenue" will boast of double rows of trees. They should be blossoming just about the time the Exhibition opens, September, 1936, and should last, with good weather, for nearly two months. Probably further extensions to the avenue will be planted along the acres of green lawns and cool ponds with their playing fountains, that will occupy the site of the tin restaurant and other halls now in process of being demolished.

Holes for the avenue trees are to be dug immediately, and the planting will commence not later than the beginning of August. Trees will arrive with their roots carefully tied up. Special soil, suitable for the species, will be placed in the excavations, which will even involve blasting in certain infertile spots.

By the time the opening of the Exhibition is due the 8 to 10 foot trees will have grown substantially and there will be an astonishingly beautiful vista up the hill, especially at night, when the whole of "Jacaranda Avenue" will be floodlit. Arrangements are being made for tourists to get a view of the Exhibition as a whole from the opposite side of the valley, on Parktown West Ridge.

Most of the trees are being planted at 20 ft. intervals, and there will be a certain number of flowering plants. All the excavations will be watered for two or three days before planting takes place, after which, unless there is a drought, practically no attention will be required.

Leading South Africans are to be asked to plant a certain number of the jacarandas at a forthcoming ceremony.

Selection of Dairy Cattle—Some Exploded Theories.

Thus "Himi" in "The New Zealand Farmer" for September:—

Whilst the conformation of a dairy cow and the evidences of constitution that she may possess are still important considerations in selecting members of the herd, the time has long since passed when other "signs" of productive ability—such as the escutcheon and yellow colouring in the ears—were treated with respectful attention. The pigment idea goes back to early Jersey Island history, and the escutcheon theory is a 19th century notion. When Francois Guenon, the son of a French gardener, developed his escutcheon theory, and wrote an elaborate treatise about it, he certainly induced many breeders to think fresh thoughts and attracted a very big band of disciples. His observation that the hair on the udders and thighs grows in opposite directions to the hair on the legs led him on to the "discovery" that great diversity existed in respect to the shape of the areas of upward-growing hair. The elaboration of the escutcheon—the "heraldic shield," the "milk mirror"—followed. Guenon persuaded many agricultural societies in France of the soundness of his theory that the "hair tufts and ovals" were true signs by which to dsitinguish the good and bad qualities of every individual cow. He was amply rewarded with money, medals and decorations from various societies, and a pension for life by the French Government. Nowadays one does not see judges in the showrings examining the escutcheon. And in mating their cattle, breeders are governed by the butterfat backing of the sires and dams, plus the possession of definitely good breed characteristics. The Babcock tester, the scales and exact records of production have simplified matters considerably, and have certainly furnished a more scientific foundation for selective breeding.

But whilst such speculative "signs" as the escutcheon and yellow pigmentation of the skin have enjoyed their little day of perhaps credulous acceptance, there are other tokens which appear to be more enduring. Eyes that are large, bright, placid and alert—as an indication of nervous temperament—for instance. Nostrils that are large, open and well distended—to permit a ready flow of big volumes of purifying air to the lungs—are strongly favoured by the vast majority of judges and demonstrators. Yet even such generally accepted good indicators as big nostrils are sometimes challenged. At a meeting of farmers recently Mr. A. H. McLinden, M.R.C.V.S., lecturer in veterinary science at Massey College, threw a bombshell amongst his audience by calmly stating that large nostrils are not necessary. He backed up the contention by saying that the opening to the windpipe was not half as big as one nostril. Upon this physiological fact the veterinarian was not contradicted, but Sir William Perry submitted the practical evidence that in travelling on a hot day the small nostrilled sheep lagged behind whilst those with open nostrils travelled better. Mr. McLinden said the openings of the larynx are fairly uniform, and he considered the dilatability of the nostril was more important than its size. Subsequently a member of the audience said it was a pity that the dilatability of the larynx itself had not also been discussed. He argued that the greater the volume of air (through big nostrils) that pressed for entrance at the windpipe, the greater the quantity of air the lungs would receive. Finally he invited the writer to gently press upon his nostrils with a thumb and forefinger and to note the instant and increased difficulty of breathing. Judging from the general comments—notwithstanding the esteem with which Mr. McLinden's judgments are usually regarded—it would seem that not many, if any, were shaken in their belief that big, open nostrils are important physical features in live stock.

Most Milk in Hind Quarters of Cow's Udder.

A professor in America designed a milking machine capable of delivering into separate containers the milk secreted by each of the four quarters of the cow's udder. He found that the two front quarters each produced slightly more than 20 per cent. of the total milk yield. The two rear quarters each produced slightly less than 30 per cent. The milk production from the right and left halves was practically uniform. It can thus be reckoned that 40 per cent. of the yield of milk of a cow comes from her two forequarters, while 60 per cent. comes from her two hindquarters.

Studying the lactation curves of a group of Friesian and Jersey cows, it was found that the general trend in the rate of milk secretion by quarters was quite uniform throughout the entire lactation period. Considering the average of each breed separately, no tendency was observed for either the front or rear quarters to secrete milk richer in fat than the other, even though there was considerable difference in the average yield of milk.

Hygienic Milking Methods.

To avoid unnecessary contamination, the milking yard and surroundings should be kept free from any accumulation of dust and manure by their removal after each milking. For the same reason it is imperative to sponge over the udders, teats and flanks of each cow before commencing to milk. Each bail should be provided with a separate bucket and sponge for this purpose, and the water should be changed as frequently as necessary. A small vessel of water is also necessary in each bail, in which the milker should rinse his hands prior to milking each cow. A hessian towel should be provided for drying the hands, and this should be washed out daily in order to keep it perfectly sweet and pure. There is not yet sufficient appreciation of the damage occasioned through neglect in these all-important preliminaries. One would think the extra comfort derived from milking a clean udder with clean hands would compel their observance. A further essential is the donning of clean overalls before commencing to milk.

Selecting a Dairy Cow.

Following is an extract from a recent publication of the Royal Agricultural Society of England:—

"The problem of judging or estimating the milk and butter producing qualities of cows by their external characteristics is an ever-present one and from time to time additional information is published regarding the degree of relationship found to exist between certain external features commonly studied in the judging of dairy cows and the yield of milk and butterfat of the same cows found from actual records. In "Agricultural Research" in 1927 a report on this subject was reviewed, and more recently a similar investigation has been carried out in France. External features such as length of head, size of barrel and spring of ribs, area of hind quarters, length of tail, size of udder and milk-wells, and amount of waxy secretion in the skin, were all studied, and the general conclusion arrived at is practically the same as that resulting from the previous investigation, namely, that the only accurate means of judging a dairy cow's value for milk and butter production is by the actual records.

"The same problem is being studied from a different angle by a group of American workers. Their method is to study by measurements of size and capacity the external conformation and the size of the internal organs of a large number of dairy cows whose records of milk and fat production are known. It was considered desirable to include a cow of beef type amongst those studied and in a recent report full particulars are given of the conformation, anatomy and skeletal structure of two cows—one a highly specialised dairy cow of the Jersey breed with exceptionally good records of production and the other a noted prizewinner of the Aberdeen-Angus breed.

"Numerous measurements and weights are given for different external features, internal organs and parts of the skeleton for the two animals, and the general conclusion states that, although in external form and appearance the two cows differed greatly, the differences in weight and size of the internal organs, apart from the milk secreting tissue of the udder, were not sufficiently great to indicate significant differences in the work done by the various organs. In skeleton structure the two cows varied somewhat but were generally similar. This similarity is taken to indicate that the evolution of the dairy and beef types, which has been accomplished by breeding and selection, has not materially altered the relationship of the bony framework of the body, but that the difference in type as commonly noted is due to the inherent tendency to produce milk associated with udder development and absence of flesh and fat. Apart from external appearance the most marked difference discovered by the examination of the internal organs was the very much larger amount of milk secreting tissue in the udder of the Jersey, although in general appearance the udder of the Aberdeen-Angus was larger."

A Dirty Milk Strainer Worse than None.

The straining of milk is always an important point in dairy practice, but a dirty strainer (cloth or gauze) is worse than none. It is sometimes noticeable after a bucket of milk has been emptied into a can that certain foreign substances have been intercepted by the strainer. These are left there, and the next bucket of milk is poured over them. When this has been done a few times the substance disappears, dissolved, and washed into the milk. It is of very little advantage to use a strainer in such a way. Very little if any time is lost by either shaking or rinsing the strainer occasionally, and large numbers of objectionable bacteria and other unclean substances would not then be added to the milk.

PLATE 182.—FISHER FALLS, INNISFAIL, NORTH QUEENSLAND.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planed in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE WEARY NURSING MOTHER.

IT is a joy to watch a lively, healthy baby of about eight months, during a railway journey, for instance, as he plays in the arms of a happy, healthy mother; he is rarely still a moment, twisting, turning, trying to raise himself on his feet, watching with eager eyes people and passing objects, clutching at those of bright hue, if they seem within reach. There is no rest for the mother, she is checking and guiding the little limbs, saving her own and other people's persons and property from damage. Her fellow-passengers are interested, amused, and sympathetic, for all are subconsciously aware that this is education for the babe, a necessary part of his becoming fitted to take his future place in the world physically and mentally. It is evident that a large amount of energy is being expended both by mother and infant.

How different is the picture when the mother is pale, tired, and exhausted by this natural display of energy in her child! Mother-love usually wins the battle against fatigue and irritability, and the babe gets his exercise, but the effort leaves her more and more wearied as the weeks go by. Too frequently she waits until she has weaned her baby, and then seeks medical advice, saying, "I have never felt well since my baby came." She may add, "Although it is weeks since I weaned him, I am still tired and nervy. My appetite is poor and fanciful, and my teeth seem to be decaying."

How can we prevent this unsatisfactory state of affairs? First we must enquire into the cause. Here is a mother who has proved herself adequate from a reproductive standpoint; she has borne and fed her baby naturally, and she is suffering as a result of the process; yet she has not developed any definite illness, for which she would receive rest in bed followed by a holiday as a part of the treatment. She would probably very much prefer such an illness to her long-drawn-out fight against weariness, vague ill-health, finicky appetite, and the irritability, which upsets the household around her. In fact, she deserves as much attention as if she had an acute illness, for hers is a most valuable life in the community.

Her poor health may indeed be the result of unrecognised disease, but in many cases the whole trouble is due simply to an ill-balanced and defective diet. She has probably been living since childhood on the border-line of a deficient diet. This means that some error or errors in diet have been present, not sufficient to cause loss of health, until there came the added calls of bearing and feeding a child. This process is a severe test, which seeks out the weak spots, and she is pushed over the border line into the territory of deficiency disease. If her

supply of iron has been defective, she will have anaemia; if her fresh fruit and vegetables have been insufficient, she will suffer from some degree of scurvy; if her supply of lime, phosphorus, and the necessary vitamin have been defective, her teeth will decay and her nerves be irritable. She is probably suffering from a mild complication of many food deficiencies. How all these may be easily avoided will be the subject of our next article.

FERTILITY OF THE FARM GARDEN.

Now that spring is here, renewed interest will be taken in the garden, which should be a feature of every farm home. Most soils can be made to produce successful gardens, points out a departmental pamphlet, though the process requires time, energy, some expense, and an appreciation of certain fundamental principles, as well as attention to such important matters as seed and plant selection, and insect and disease control.

Intensive gardening demands a higher degree of soil fertility than does ordinary field crop culture. An efficient system of soil management should not only make allowance for the present crop, but should aim at an ever-increasing reserve of fertility. It should determine the necessity and value for the particular soil of organic matter, how most economically to apply this material, then attempt to supplement this where necessary, by liming and the addition of artificial fertilizers.

FERTILIZERS FOR THE HOME GARDEN.

FOR the maintenance of fertility the city gardener has to place his chief dependence on chemical fertilizers, and the grower who lacks information as to the plant food content of his soil, and who desires to grow a wide range of crops of whose requirements he knows little, should play safe by using a high-grade "complete" fertilizer, and give a liberal application. Though he applies more than the plants actually require, the increased cost is so slight that the assurance of having enough is worth the additional expense.

A complete fertilizer is one supplying nitrogen, phosphorus, and potash in forms readily available to plants. A generally applicable complete fertilizer for home garden use consists of a mixture of dried blood, superphosphate and sulphate or chloride of potash. These substances in the proportions by weight of 3, 4, and 1 respectively give a 5-11-6 fertilizer, or one containing 5 per cent. nitrogen, 11 per cent. phosphoric acid, and 6 per cent. oxide of potash. On light-textured soils potash could be increased by using the same substances in the proportions of 2, 3, and 1, when a 4-11-8 fertilizer would be obtained.

Dried blood has many advantages as a source of nitrogen. It does not damage seeds or seedling roots, becomes available when the root system is developing, and is therefore not lost. It is a useful basal form of nitrogen application, carrying plants up to the stage where it may be advantageous to apply forcing soluble nitrogenous fertilizers.

Sulphate of ammonia may be used in place of dried blood in the complete mixture, but should be used in two-thirds the quantity. The use of sulphate of ammonia results in loss of lime from soils, and in time develops strong acidity. These harmful effects are easily overcome by liming, but it is not advisable to use this fertilizer on acid, lime-deficient soils.

The tendency in home gardens is to use quantities of manure without the application of potash and phosphate, and results in a bad nutrient balance, which accounts for the frequent reports of plants producing excessive vegetative growth, with poor flower, fruit, or tuber production. Under such conditions the addition of a mixture of four parts of superphosphate and one of sulphate or chloride of potash would result in a better nutrient balance.

For crops such as lettuce, cauliflower, cabbage, Brussels sprouts, spinach, and celery, where vigorous growth must be maintained, liquid fertilizers can be applied when the plants are well established. The following flowers, provided a complete fertilizer has been used initially, have been found to respond to nitrogenous top-dressing:—Dahlia, chrysanthemum, calendula, Iceland poppy, sweet pea, primula, &c. The soil should be moist before the application of liquid fertilizers.

The most efficient forms of nitrogen for liquid application are nitrate of potash, nitrate of soda, or a mixture of these salts, and nitrate of lime. Sulphate of ammonia, phosphate of ammonia, or a complete liquid fertilizer consisting of nitrate of potash and superphosphate may be used. These substances are soluble in water (superphosphate will leave a considerable residue) and can be dissolved at the rate of 1 to 2 oz. per gallon, and the solution run along the rows from a water-can with the sprinkler removed, or applied with a measure in the case of larger, spaced plants.

If the liquid comes in contact with the leaves, these may be hosed down after the application has been made, to obviate the possibility of injury.

The practice of broadcasting fertilizers is wasteful, since much of it will not come within the absorbing range of roots. When seeds are planted in drills, these should be opened up several inches broad at the bottom and from 1 to 3 inches deeper than the seed is to be placed. The fertilizer is then distributed along the bottom of the row, at the rate of an ounce or two to the yard, the drill filled in to the desired depth, and the planting made.

With large growing plants that are spaced, such as tomatoes, cabbages, and potatoes, a hole a foot in diameter and several inches deep can be made with a spade, and a small handful of fertilizer scattered in the hole before filling in and planting above the fertilizer. Fertilizers for potatoes should be slightly below and in a ring about the tuber, rather than directly beneath it.

A South African Water Garden.

A garden-fringed artificial lake, fed by an artificial waterfall, cascading down the side of the kopje at Milner Park is another spectacle, the construction of which has been decided on for next year's Empire Exhibition.

Some doubt was felt at the outset as to the technical feasibility of constructing a lake on the side of a hill, and as to the possibility of porous sub-soil causing the water to "leak."

Experts connected with the Exhibition Head Office have, however, now given their verdict in favour of the project.

Situate immediately below the existing big Hall of Transport in which the great motor-car display is held at the ordinary Rand Show, the lake will be 1,000 feet in circumference, and cover several acres.

Fed from the municipal mains a skilfully-devised "brook" will flow over the crest of the bluff on which the Hall of Transport restaurant is situated, and will then pass as a realistic spray-laden cataract for 30 or 40 feet to the level of the lake. The water is to flow beneath a bridge before entering the pool and will ultimately drain out in a remote corner of the grounds into an existing storm-water sluit.

Expert advice has been secured from the leading authorities at Johannesburg and Pretoria in connection with the lay-out of a "South African Water-Garden," which will be the first of its kind, and will surround the lake.

Down the side of the hill a mass of ferns are to be planted, which will, together with other plants, give a replica of some of the famous gorges on the slopes of Table Mountain, including species of flowers never before seen in the Transvaal.

Two thousand spectators will be accommodated in an *al fresco* open-air theatre, for which the seats are to be cut into the bluff on either side of the waterfall.

Water-lilies and aquatic plants belonging to the country are to be placed in the lake and along the stream, which will be the centre of the charming garden, and one of the most popular resorts at Milner Park.—"South African Country Life."

Orchard Notes for November.

THE COASTAL DISTRICTS.

NOVEMBER is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few lines, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and if the soil is deficient in lime a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants, that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time, so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium of potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Acts, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do no breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

Farm Notes for November.

FIELD.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant

has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

CARE OF NEW-BORN FOALS.

The market value of sound, well-bred horses to-day, both heavy and light, certainly justifies every care being taken in rearing. The most common direct cause of loss among foals is, undoubtedly, blood-poisoning through the navel cord, though poor condition of the dam, due to improper feeding or lack of exercise during pregnancy, may also be a contributing factor, by resulting in deficient vitality in the offspring.

It should be the aim of the breeder to produce and raise vigorous foals that will develop into strong, useful horses, with plenty of staying power. For this it is a first essential that the mare be managed and fed in an intelligent fashion, particularly during the latter months of gestation. Over-feeding and pampering during pregnancy should be avoided, and care taken to ensure sufficient exercise.

While the pregnant mare should be given no chance to overstrain herself at work—as by "backing" a heavy load when in shafts, it is equally important to provide regular exercise, up to the final three or four weeks, at least. In the case of a farm mare, this may best take the form of working in chains, as at ploughing, or ahead of another animal which is in shafts when on carting work. The desirability of preventing any sudden fright or violent galloping towards the end of the gestation period is obvious.

For the mare's diet as she approaches parturition there is nothing better than good oats—preferably crushed, scalded bran, and long hay, supplemented by a few roots or a little green fodder.

Foaling is best arranged to take place in a roomy loose-box, thoroughly cleansed and disinfected for the occasion, and well bedded with fresh straw.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the month of August in the Agricultural Districts, together with Total Rainfall during 1935, and 1934, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.,	No. of Years' Records.	Aug., 1935.	Aug., 1934.
North Coast.	In.		In.	In.
Atherton	0·88	34	1·76	0·29
Cairns	1·73	53	2·85	0·53
Cardwell	1·26	63	1·92	1·96
Cooktown	1·22	59	1·40	0·23
Herberton	0·65	49	0·75	0·37
Ingham	1·43	43	0·86	1·29
Innisfail	4·87	54	11·31	1·56
Mossman Mill ..	1·39	22	0·83	0·87
Townsville	0·51	64	Nil	0·27
Central Coast.				
Ayr	0·58	48	Nil	0·22
Bowen	0·66	64	0·05	0·59
Charters Towers ..	0·54	53	Nil	0·62
Mackay	1·04	64	1·00	0·42
Proserpine	1·35	32	1·54	1·03
St. Lawrence ..	0·80	64	1·06	Nil
South Coast.				
Biggenden	1·10	36	1·11	1·31
Bundaberg	1·29	52	0·59	1·64
Brisbane	1·98	84	1·64	1·26
Caboolture	1·53	48	2·21	1·63
Childers	1·22	40	1·19	1·59
Crohamhurst ..	2·15	42	4·96	1·20
Esk	1·48	48	0·82	1·56
Gayndah	1·16	64	0 83	1·80
Gympie	1·71	65	1·73	1·42
Kilkivan	1·44	56	0·59	0·98
Maryborough ..	1·70	64	1·16	2·02
Nambour	1·82	39	4·62	1·59
Nanango	1·33	53	1·35	2·23
Rockhampton ..	0·83	64	0·52	0·46
Woodford	1·67	48	2·63	0·47
Central Highlands.	In.		In.	In.
Clermont	0·69	64	0·21	Nil
Gindie	0·64	36	..	Nil
Springsure ..	1·05	66	0·40	0·16
Darling Downs.				
Dalby	1·20	65	0·94	0·95
Emu Vale	1·08	39	0·46	0·51
Hermitage	1·17	29	..	0·74
Jimbour	1·16	47	0·68	1·23
Miles	1·11	50	0·81	0·26
Stanthorpe	1·78	62	0·74	2·46
Toowoomba ..	1·65	63	0·95	1·40
Warwick	1·45	70	0·62	0·85
Maranoa.				
Roma	0·91	61	0·59	0·07
State Farms, &c.				
Bungeworgorai ..	0·74	21	..	0·21
Gatton College ..	1·12	36	0·51	1·01
Kairi	0·91	21	..	0·30
Mackay Sugar Experiment Station	0·89	38	0·68	0·27

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1935.

Compiled from Telegraphic Reports.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·01	80	63	84	1	53	1,2	140	4
Herberton	..	71	50	81	1, 2, 30	27	5	75	9
Rockhampton	30·16	76	53	84	2	42	6	52	6
Brisbane	30·20	70	50	78	31	43	11	164	9
Darling Downs.									
Dalby	30·19	69	41	78	2, 31	30	1	94	5
Stanthorpe	..	62	35	70	8, 31	19	18	74	7
Toowoomba	..	65	43	75	2, 22	30	5	95	7
Mid-Interior.									
Georgetown	30·04	84	57	91	30, 31	36	5	Nil	..
Longreach	30·13	76	46	84	28, 31	36	5	6	1
Mitchell	30·19	69	39	78	28	27	17	131	4
Western.									
Burketown	30·05	84	59	92	3	46	5	Nil	..
Boulia	30·11	78	50	89	1, 28	41	5	18	2
Thargomindah	30·16	71	..	86	28	..	..	75	3

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October. 1935.		November. 1935.		MOONRISE. Oct., 1935.	MOONRISE. Nov. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·34	5·51	5·3	6·9	7·3	8·18
2	5·32	5·52	5·2	6·10	7·44	9·16
3	5·31	5·53	5·2	6·10	8·32	10·19
4	5·30	5·54	5·1	6·11	9·26	11·23
						p.m.
5	5·29	5·55	5·0	6·12	10·22	12·28
6	5·27	5·56	4·59	6·12	11·23	1·32
					p.m.	
7	5·26	5·56	4·59	6·13	12·28	2·35
8	5·25	5·57	4·58	6·14	1·35	3·41
9	5·24	5·57	4·58	6·15	2·42	4·50
10	5·23	5·57	4·57	6·16	3·48	6·1
11	5·22	5·58	4·57	6·17	4·55	7·7
12	5·21	5·58	4·56	6·17	6·5	8·10
13	5·20	5·58	4·55	6·18	7·14	9·10
14	5·19	5·59	4·54	6·19	8·24	10·1
15	5·18	5·59	4·53	6·20	9·29	10·46
16	5·17	5·59	4·53	6·21	10·29	11·25
						a.m.
17	5·16	6·0	4·53	6·21	11·23	12·0
18	5·15	6·0	4·52	6·22	a.m.	
19	5·14	6·1	4·52	6·22	12·11	12·30
20	5·12	6·2	4·52	6·23	12·51	12·58
21	5·11	6·2	4·51	6·23	1·27	1·29
22	5·10	6·3	4·51	6·24	2·0	1·57
23	5·9	6·3	4·51	6·25	2·29	2·30
24	5·8	6·4	4·50	6·26	2·59	3·4
25	5·7	6·5	4·50	6·26	3·27	3·41
26	5·6	6·6	4·50	6·27	3·59	4·26
27	5·6	6·6	4·50	6·28	4·31	5·16
28	5·5	6·7	4·49	6·29	5·5	6·12
29	5·4	6·7	4·49	6·30	5·43	7·13
30	5·4	6·8	4·49	6·31	6·31	8·5
31	5·3	6·9			7·23	

Phases of the Moon, Occultations, &c.

5 Oct.	☾ First Quarter	11 40 p.m.
12 ,,	○ Full Moon	2 39 p.m.
19 ,,	☽ Last Quarter	3 36 p.m.
27 ,,	● New Moon	8 15 p.m.

Perigee, 11th October, at 2.36 p.m.
Apogee, 23rd October, at 11.24 p.m.

In the early morning hours near the middle of October the beautiful planet Venus will exceed the brilliance it displayed during the first week or two of August, when, however, the time, shortly after sunset, was much more convenient for popular observation. When at its brightest Venus may be seen in the day time, if sufficient care is taken to shield off the sunlight and to locate Venus at the distance from the Sun, which can be estimated by the time given for the planet's rising and setting.

Mercury will be passing from east to west of the Sun on the 18th, but instead of a transit of the Sun's face Mercury will be one degree (twice diameter of Moon) south of the Sun.

Soon after the Moon rises at 3 a.m. on the 24th the nearness of Venus, 3 degrees north, will form an interesting spectacle.

Mercury sets at 7.45 p.m., one hour 54 minutes after the Sun, on the 1st; on the 15th it sets 34 minutes after the Sun (invisible).

Venus rises at 3.48 a.m. and sets at 3.37 p.m. on the 1st; on the 15th it rises at 3.14 a.m. and sets at 2.59 p.m.

Mars rises at 8.54 a.m. and sets at 10.45 p.m. on the 1st; on the 15th it rises at 8.42 a.m. and sets at 10.35 p.m.

Jupiter rises at 7.57 a.m. and sets at 9.16 p.m. on the 1st; on the 15th it rises at 7.10 a.m. and sets at 8.35 p.m.

Saturn rises at 3.19 p.m. and sets at 4.14 a.m. on the 1st; on the 15th it rises at 2.20 p.m. and sets at 3.17 a.m.

The Southern Cross will be at its highest point, XII., at midday, and at its lowest position, VI., at midnight on the 1st, but one hour earlier on the 16th. By subtracting the observer's latitude from 30 degrees the distance below the horizon of the Cross when at VI. can be fairly ascertained; thus at Warwick it will be just about 2 degrees, at Brisbane 2½ degrees, and at Townsville 11 degrees. Its disappearance will be about 2 hours earlier at Brisbane and Warwick and 3 hours earlier at Townsville.

4 Nov.,	☾ First Quarter	9 12 a.m.
11 ,,	○ Full Moon	12 42 a.m.
19 ,,	☽ Last Quarter	10 36 a.m.
26 ,,	● New Moon	12 36 p.m.

Perigee, 8th November, at 8.48 p.m.
Apogee, 20th November, at 4.0 p.m.

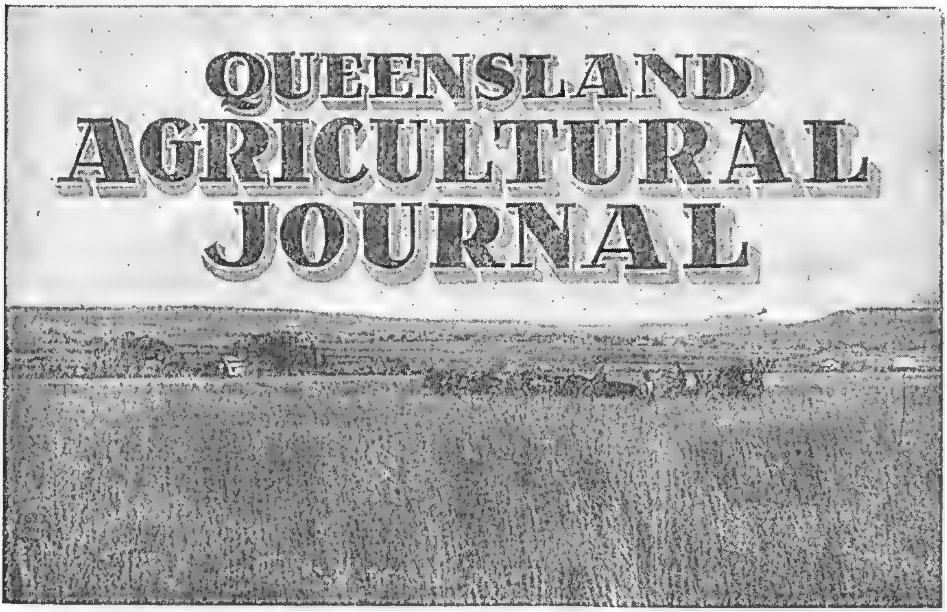
For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten shillings,** including postage.



VOL. XLIV. 1 NOVEMBER, 1935. PART 5

Event and Comment.

The Quality of Dairy Products—Move to Improve.

FROM a primary producer's point of view, one of the notable events of the month was the introduction of the Dairy Produce Acts Amendment Bill, the object of which is to provide regulatory measures for the improvement of the quality of dairy products. The major principles of the Bill involve, firstly, the necessity of a cream supplier giving twenty-eight days' notice of his intention to discontinue supplying one factory in favour of another; and, secondly, the licensing of cream carriers. The Bill was introduced by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, who, in the course of its Initiation in Committee said—

> It must be remembered, in approaching a question such as is involved in this Bill, that the days of production, and production alone, are definitely past. The farmer to-day needs an economic organisation to make marketing profitable. The provision of that marketing organisation and his cultural care are both matters that require the practical sympathy and whole-hearted support of the Government, whatever Government happens to be in power. A good deal of attention has been focussed during the last twelve months on the question of quality in Queensland produce. . . . It is no exaggeration to say that the campaign on which I am entering is necessary in order to preserve stabilisation

and more essential in order that we should give the British people the very choicest butters. There are some people who habitually do not produce cream that will churn into first-class butter, or send milk to a factory that will ever make first-class milk standards. My experience is that the average farmer, who is not in any other business, is quite prepared to do all those things that are necessary to achieve equal standards. We have abandoned the practice that obtained in the past whereby our dairy inspectors made regular visits through regular territory and inspected in a regular way the dairies of various producers with whom they came in contact. In reversal of that policy—for I believe a true test of a dairyman's practice lies in the can that he delivers—our dairy inspectors have now in the main been attached to dairy factories. We have prepared a schedule and the factory managements supply us each week with the names of suppliers who forward inferior cream. We do not bother the man who is supplying first-class cream.

Maintenance of a High Cream Standard.

EXPLAINING the amending legislation, the Minister remarked that one or two important departures were proposed, but, apart from the entirely new principles involved, its general provisions were mainly of a machinery nature. He added—

The first new principle requires an individual to give twenty-eight days' notice before diverting his milk or cream supplies from one factory to another. . . .

The provision prohibiting supplies being removed for twenty-eight days is a very definite attempt to bring about what I believe to be necessary, and what the industry believes to be necessary—an improvement in quality. . . . When a dairy inspector goes along to the factory and finds that a man who is supplying three times a week has had three condemnations, he will immediately get in touch with that individual; and the individual concerned will know that the dairy inspector is on his track. Is there not a temptation for the producer to transfer his supply of cream to some other factory? We could follow that cream, no doubt, but it would mean that the man attached to the factory in the district to which the cream was sent would have to get in touch with the individual in the district where the cream belonged, and that would lead to all sorts of difficulties, much correspondence would result, and valuable time would be lost. My aim is that when a man sends in bad cream we shall have twenty-eight days in which to discover the reason. At the end of that time he can go to Timbuctoo, or as his fancy dictates; but during that period of twenty-eight days, in the interests of the industry and the individual himself, we claim we can do material work to improve substantially the quality of his cream. If he can pull out as soon as we get on to his track then the whole system tends to defeat itself, and the valuable work of valuable officers may be nullified. . . .

New Zealand has much more rigid conditions in this respect than I propose to impose. New Zealand butter always sells at a higher price than Australian butter. I know there are other factors. . . .

One reason why New Zealand butter sells at a higher price than Australian is because there is less variation in its quality. That is obtained by regimenting supplies, practically zoning factory districts and forbidding suppliers to change over from one factory to another. That is practically prohibiting "wandering suppliers." By these means they have made it possible to market two brands of butter only . . . . and thereby protected dairy quality. . . . At one time there was no regulation so far as cream suppliers were concerned; they could send their product from one end of Queensland to the other, if it were feasible. For example, cream may be sent from Gympie to be churned at Kingston, and cream may be sent from Kingston territory to be churned, say, at Gympie. I am using those factories as an illustration to prove my statement. I have had a careful analysis made of supplies, and I find the "wandering supplier" is a serious factor in factory efficiency. The figures relating to a factory situated closer to this House than any other illustrates the whole position. Out of 121 suppliers of second quality cream, forty-eight are outside what may be termed the immediate manufacturing zone. There is a very grave lesson to be learned from these figures. I believe, with my friend, the hon. member for Fassifern, that the real solution of the question of the "wandering supplier" is zoning; but I believe we shall have to approach zoning through a series of graduated supplies, and that will eventually be accomplished.

Transport of Cream.

STRESSING the necessity for an improvement in the system of cream cartage now in vogue in practically every dairying district in the State, Mr. Bulcock continued—

Associated with this question of quality of dairy produce is the transport of cream. There are people living here, there, and everywhere and various delivery vans bring in the cream at varying intervals. Some vans make two deliveries a week and others one every day. It is desirable that there should be some control over the road transport of cream and this Bill provides that road transport licenses shall be issued to carriers under the jurisdiction of the factory. That certainly will have a tendency towards achieving the objective of zoning—it is certainly another step in that direction. Hon. members representing sugar areas could not contemplate letting sugar go past one mill to be processed at another. Areas are assigned to each mill, and cane is not a highly perishable product such as cream.

Cream is sometimes transported under very undesirable conditions. I admit that from an administrative point of view much has yet to be done. I recognise that even though we can very substantially strengthen the organisation so far as road transport is concerned it is still necessary to pay some attention to rail transport in order to effect the general improvement that is necessary.

White Wax Scale.*

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

THERE are two species of scale insects found in Queensland which are aptly described by the vernacular name white wax, but only one of these attacks citrus trees. The two species are very similar in external appearances, and before taking any measures to eradicate a species of plant because it carries a population of such a scale insect, it may be wise for citrus growers to obtain a definite identification, particularly when the expenditure of money is involved.

The species which attacks citrus is found on a number of other plants also, the commonest of which are river cherries, Gardenia, persimmon, and guava.

Like its close ally, the pink wax scale, the white wax (Plate 1) is more commonly found in humid coastal parts than in more inland districts, and it is in fact a rather rare insect west of the Great Dividing Range. It appears that the white wax is partial to temperate climates, and this is no doubt the reason why the scale is much more important in New South Wales than in this State. Until recently white wax has rarely caused orchardists in Queensland any concern, but during the past few years there has been a considerable increase in the amount of the scale found here, particularly in citrus producing districts in the south-eastern parts of the State. This increase may prove to be only temporary, but it is advisable for growers to keep the scale well in check by taking appropriate steps for its control whilst there is no great amount of it in their orchards.

Description.

The following description is necessarily too general to allow growers to differentiate between the two species of white wax, but will serve to show the difference between the white wax and other species found on citrus. As has been stated the vernacular name describes the general appearance quite well. The young crawlers after a brief migratory period settle down to feed and then quickly become covered with a waxy coating, the margins of which are produced in a series of arms or rays. Soon the form changes and the wax takes on a general conical shape. As development proceeds the conical shape is gradually replaced by a more globular form, somewhat flattened on the top and with irregular protruberances on the sides. Colonies are frequently so crowded that the outline of the scales may be considerably modified and the whole appear like a series of irregular masses of wax along the twig. The colour at first is pure white and shining, with a snow white line of flatter tone marking the position of the openings of the breathing organs. Later the general colour becomes duller, and old specimens may be almost grey. The average length of the scale of full grown females is about three-eighths of an inch.

Habits and Life History.

As white wax has up to the present been of but minor importance in Queensland, comparatively little work has been done in connection with it, and consequently a complete account of its habits and life history

* *Ceroplastes destructor* Newstead.

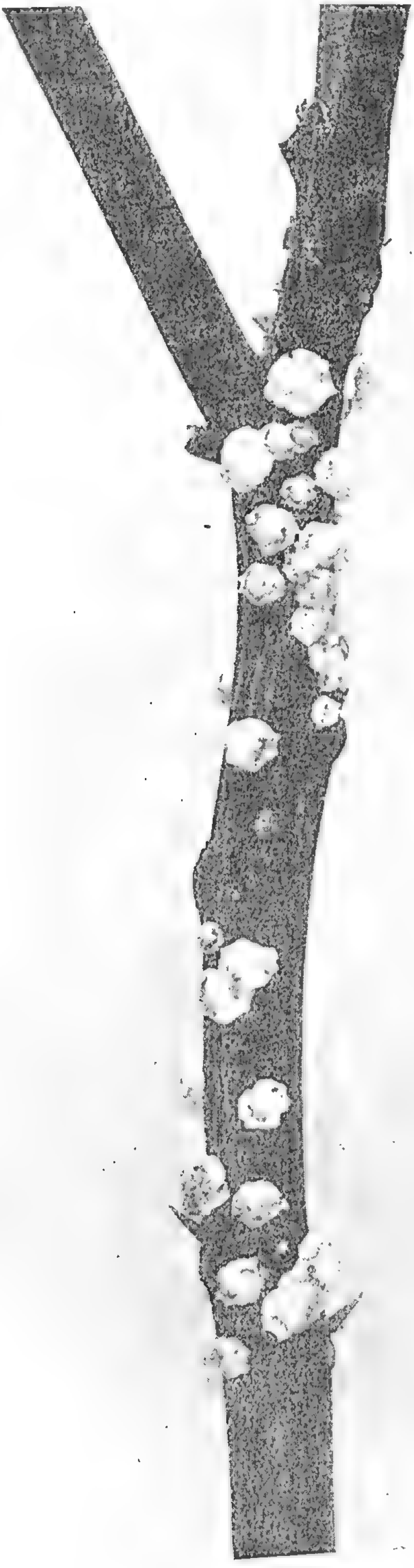


PLATE 183.
White Wax Scale showing infestation on small branch.

cannot be given. The scales for the most part settle down on the more tender parts of the host plant. Large numbers of young are often found on the leaves, but apparently these do not persist, and it is unusual to find individuals of appreciable size on the foliage. Whilst the largest colonies of young are to be found on the very tender parts, the greatest number of well grown scales are generally seen on hardened growth just below the twigs. This is due to a certain extent to the fact that the period of development is rather long and, though the young select tender parts on which to feed, by the time the adult stage is reached the tree has grown appreciably, and the attacked part has become somewhat woody. This is unlike the case of pink wax, in which species the individuals are always found on the most tender growth available.

The damage done by white wax is greater than that done by comparable colonies of pink wax. The former species, however, cannot be described as a voracious feeder and though appreciable damage is done by larger colonies in a comparatively short time, this is light compared with what follows when similar colonies of red or mussel scales are present. Sooty mould is usually associated with the white wax colonies, but its development is seldom excessive and is small compared with what occurs in the case of pink wax and some species of soft scale such as Pulvinaria.

There is apparently only one full brood of white wax each year. Young may be found as early as November, but usually it is December before large numbers make their appearance. Further emergencies take place during January and even in February many crawlers are sometimes found. This is the main breeding season. In addition to this in some parts there is evidence that smaller hatchings take place later in the year, and although no verified data are available it appears that chance hatchings may occur as late as May. There is thus rather a protracted period over which young may be found, and this may at times make it rather difficut to obtain a very satisfactory control. Fortunately, however, it appears that the chance hatchings are always rather light.

Control.

It is necessary to time the application of control measures so that, whilst the emergence of young is as complete as can be desired, it is the youngest possible individuals which will be combated. It will often be impossible to wait long enough to allow of the total emergence being completed without some of the new brood being too old to be assuredly vulnerable. The time of application of control measures thus becomes a matter of judgment. The time of breeding depends on a number of variable factors and therefore a definite time of application cannot be stated. It is thus essential in all cases for growers to make the necessary observations themselves and use their own judgment.

When a very few tree are lightly infested, as is the case now in many orchards in the Maroochy district particularly, it is advisable to remove the infested portions of the trees and burn them. When the number of colonies or their size prevents this being practical or economical, use must be made of scalicides. The most useful spray, generally, is a wash consisting of 1½ lb. of clean fresh washing soda to each 4 gallons of water. The resin-caustic soda-fish oil mixture, the formula of which is resin 10 lb., caustic soda of good commercial quality 3 lb., fish oil, preferably herring oil, 1½ lb., and water 40 gallons, is also very effective if used at

the correct time. This spray, the details of the preparation of which are available in other Departmental entomological publications, is most useful in those districts in which the bronze orange bug occurs, or where a complexity of scale insects must be combated.

Fumigation with hydrocyanic acid gas is not likely to find much employment against white wax, as in those districts in which this species is a pest, fumigation is not recommended as a rule owing to climatic conditions. The fumigant has not been tested for this reason, but it would almost certainly be effective against the scale.

The soap and washing soda mixture recommended for use against pink wax cannot be recommended in this case for general use, as it is efficient only when applied against the very youngest individuals. From what has been stated above it will be seen that most frequently only a proportion of the insects at any one time would thus be vulnerable to this spray.

PLATE 184.

MONUMENT TO PIONEERS OF THE SUGAR INDUSTRY.

The unveiling of the Memorial Cairn at Ormiston, near Brisbane, was performed by the Premier, Hon. W. Forgan Smith, LL.D., in the presence of a large gathering, including delegates to the Fifth Triennial Congress of the International Society of Sugar Cane Technologists, representing twelve countries besides Australia. Mr. Forgan Smith delivering the dedicatory address.

Spraying Experiments for the Control of Fruit Fly in the Stanthorpe Districts.

By HUBERT JARVIS, Entomologist.

DURING the 1933-34 season a nicotine sulphate-white oil spray was tested for fruit fly control on Granny Smith apples, and the results appeared sufficiently promising to warrant further experiments. It was accordingly decided to continue such experiments but to design them to embrace earlier susceptible varieties of apples, and certain varieties of plums. The results obtained during the 1934-35 season are detailed in the following report.

Experiment No. 1.

The first experiment was carried out at The Summit on the orchard of Mr. A. H. Paget, the fruit selected being Wilson plums. The effect of applying a white oil spray to plums was unknown and it was considered that there might be some risk of spray injury or of destroying the bloom of the fruit, hence only five trees were selected for this experiment. The trees chosen were of a reasonable size for spraying with a knapsack spray fitted with a four foot extension rod and they carried a very good crop of fruit.

The sprays tested were nicotine sulphate-white oil, used at a strength of half a pint of nicotine sulphate and half a gallon of white oil to 40 gallons of water, and white oil alone used at the rate of half a gallon of the oil to 40 gallons of water.

The sprays were first applied on October 29th, when the plums were about half grown, and further applications were made at weekly intervals until December 10th, making six treatments in all, the final sprays being applied when the fruit was almost ready to pick. On the last mentioned date a disastrous hail storm occurred causing the almost complete destruction of 70 per cent. of the fruit.

No actual damage to the fruit from the white oil, or from the nicotine sulphate-white oil sprays could be detected, but it was noticed that the sprays used accelerated the colouring of the fruit although they did not cause any fruit drop. Both sprays, however, rendered the appearance of the fruit somewhat unattractive in that they caused it to become rather shiny and greasy. This, however, was not considered by the grower to be a serious detriment to its market value.

At the time of each spray application a general examination was made of the fruit on the experimental trees, and no indication of fruit fly infestation was discovered either on the sprayed or unsprayed trees. The experiment was accordingly inconclusive.

Experiment No. 2.

The second experiment was also carried out at The Summit on the orchard of Mr. R. Wells, work therein commencing on November 7th.

The trees selected were twenty-one in all, there being seven each of the following varieties of apples—Marjory Hay, Gravenstein, and Delicious. Marjory Hay is one of the earliest apples, being ready for market by the middle of December, and is very susceptible to fruit fly

attack. The Gravenstein and Delicious, on the other hand, are varieties which mature very much later and had received only one application of spray when the fruit was destroyed by hail; hence the following notes on Experiment No 2 refer entirely to Marjory Hay apples. The sprays used were nicotine sulphate-white oil, white oil alone, and a colloidal sulphur. The first and second sprays were used at the same strength as in the first experiment, while the colloidal sulphur was used at the rate of one ounce to four gallons of water. The first application was made to the Marjory Hay apples on November 7th, when the fruit was about an inch in diameter, and further treatments were given at weekly intervals until December 10th, when the experimental trees were very severely damaged by hail.

During the course of the experiment a good deal of fruit drop was noted, but this is in accordance with the general character of the variety. The nicotine sulphate-white oil and white oil alone caused slight scalding where apples were exposed to the sun's rays, and the colloidal sulphur application caused the formation of minute discoloured spots immediately beneath the droplets of spray where they had dried on the fruit. Both blemishes, however, were barely perceptible and did not affect the market value of the fruit.

The windfalls were gathered every week and a general examination of the apples on the sprayed and unsprayed trees was also made, but no indication of fruit fly incidence was noted, either in the windfalls or in the fruit on the trees up to December 10th, when the fruit was destroyed by hail. This experiment was also inconclusive.

Experiment No. 3.

The third experiment was carried out in the orchard of Mr. E. Cran at Severnlea, on whose property the work was instituted last season. Four trees each of the Gravenstein, Jonathan, and Delicious varieties of apple were selected for the experiment, each of these varieties being subject to fruit fly attack.

The trees chosen were fairly wide apart, each variety being in a separate row, and the sprays employed and the strengths were as in the preceding experiment. Approximately one gallon of spray fluid was used per tree per application, the cost of the four applications of nicotine sulphate-white oil per tree being 7.08d., of the white oil alone 3.06d., and of the colloidal sulphur 2.12d. Four treatments were given to the Gravensteins and five to the Delicious and Johnathans, all the applications being made during sunny weather. The experiment was then discontinued owing to the practical disappearance of fruit fly from this orchard. The fruit fly was of course present during the earlier stages of the experiment as was indicated by the heavy infestation in the Gravenstein control tree. The Gravenstein matures several weeks before the Johnathan and Delicious, and when the fruit fly infestation occurred in the firstmentioned variety, the others were too immature to be attractive to the fly.

Slight scalding owing to hot sunshine occurred in the case of the nicotine sulphate-white oil and white oil alone, more particularly on the Johnathans, and the minute spotting under the droplets of colloidal sulphur, mentioned in discussing the previous experiment, also occurred in this case. As before, the blemishes were of no practical consequence.

The results obtained in the case of the Gravensteins are set out in Table I., and indicate that all three sprays gave some measure of protection from fruit fly attack. Owing to the high cost of the nicotine sulphate-white oil mixture, it was particularly desired to ascertain if white oil alone would be as effective as the combination spray, but this was not the case, white oil being the least satisfactory of the three as it gave only 59.6 per cent. of sound fruit. The colloidal sulphur with 70.6 per cent. of sound fruit was not far behind the nicotine sulphate-white oil spray in efficiency, the latter giving 77.6 per cent. of sound fruit. The colloidal sulphur is an easy spray to mix and apply, and is more economical than the nicotine sulphate-white oil mixture.

TABLE I.

RESULTS OF FRUIT-FLY SPRAYING EXPERIMENT ON GRAVENSTEIN APPLES.

Treatment.	Total Number of Apples.	Sound.	Per Cent. Sound.	Unsound.	Fruit Fly-infested.
Nicotine sulphate-white oil	156	121	77·6	35	35
White oil alone	213	127	59·6	86	86
Colloidal sulphur	143	101	70·6	42	42
Control	177	79	44·6	98	98

After the harvesting of the Gravenstein apples late in January, no data of any value was secured from this experiment.

The owner of the orchard, who had obtained good results from the nicotine sulphate-white oil spray on Gravenstein apples, not included in the experiment now under discussion, in other parts of the orchard, then decided to spray the whole of the remaining crop of apples of all varieties at weekly intervals, and this may have had some influence on the subsequent scarcity of the fly in the orchard. Further treatments were given to the Johnathan and Delicious trees on the experimental plots, but practically no fly infestation occurred either in the treated or untreated trees, and on the 27th of February, the experiment was discontinued.

Experiment No. 4.

The fourth experiment was carried out at Broadwater, on the orchard of Mr. H. M. Jones, where four President plum trees carrying a good crop of fruit were selected from a row of 20 trees, one sprayed tree and one control tree being situated at each end of the row.

The spray used was the nicotine sulphate-white oil combination at the strength employed in the other experiments. Three applications were made commencing on January 18th, the fruit being picked on February 14th.

The natural colour of the President plum is a deep purple red with an attractive bluish bloom, and this appearance was spoilt by the spray, the plums being greasy and dull in patches. with a little bloom showing here and there. They were, however, quite saleable and realised a fair price on the market.

The spray appears to have afforded some protection from fruit fly attack in this case as will be seen by reference to Table II., which shows that the treated trees gave 87.0 per cent. and 94.2 per cent. of sound fruit, whereas the untreated trees yielded only 57.5 per cent. and 51.7 per cent. of sound fruit.

TABLE II.

RESULT OF FRUIT-FLY SPRAYING EXPERIMENT ON PRESIDENT PLUMS.

Tree.	Total Number of Plums.	Sound.	Per Cent. Sound.	Unsound.	Fruit Fly-infested.
Sprayed Tree, No. 1 ..	477	415	87·0	62	62
Sprayed Tree, No. 2 ..	411	387	94·2	24	24
Control Tree, No. 1 ..	452	260	57·5	192	192
Control Tree, No. 2 ..	387	200	51·7	187	187

Summary.

The results of the season's experiments with fruit fly sprays were rather inconclusive partly because of the hail incidence and partly because of the absence of fruit fly infestation in certain of the experimental orchards during the course of the work. Nevertheless, the results obtained seem to warrant further investigation of the possibilities of sprays for the control of fruit fly.

Acknowledgements.

The writer desires to record his appreciation of the very helpful co-operation rendered by those orchardists who made their trees available for the purpose of the experiments, and also his appreciation of the assistance and advice of the Chief Entomologist, Mr. Robert Veitch.

The Buffalo Louse (*Haematopinus tuberculatus*), Nitzsch, on Cattle in Queensland.

By F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

THE common sucking louse of cattle in Queensland is the short-nosed cattle louse, *Haematopinus eurysternus*, Nitzsch, of which two forms have been seen. In the tropical portions of the State, the species is represented by a large dark form, whilst in the south, these lice are in general, smaller and lighter in colour. On young cattle the long-nosed cattle louse, *Linognathus vituli*, Linnaeus, is fairly frequent. Recently (1935) the writer recorded the presence of a third species of sucking louse on cattle in this State, namely *Solenopotes capillatus* Enderlein, the tubercle bearing cattle louse.

In 1929, a specimen of the tail switch of a cow which was literally covered with louse eggs was received from Townsville. As no lice were present, no identification of the species to which the eggs belonged could be made. Four years later, a further specimen from a bullock was received from Gregory Downs, Gulf of Carpentaria, taken by the Stock Inspector, Mr. Seamer, and with it were several well grown specimens of a sucking louse. These lice were subsequently identified as *Haematopinus tuberculatus*, Nitzsch, the sucking louse of the buffalo, *Bubalus buffelus*. Enquiries made by the writer during a visit to this district elicited the information that tail switches heavily infested with lice are not uncommon among the cattle here. It is considered that these infestations are concerned with this louse, as the tail switch is the most usual site of infestation by this species. The species was first recorded from Australia in 1913 by Johnston and Harrison who noted its presence among dromedaries in north-west Australia. It was later reported by Dickinson and Hill (1916) as infesting calves at Darwin, Northern Territory.

The buffalo louse is mentioned as infesting cattle in Mozambique and in the West Indies. Van Volkenberg (1934), reporting on its presence in Porto Rico, refers to the species as the large tail louse of cattle, and notes that heavy infestations are found especially on stalled cattle. The species is said by him to be very common among cattle on the southern coast of the island.

Other records show this louse to be present in Italy, Belgian Congo, Phillipine Is., Guam, and British Guiana, where it has been taken on imported Indian buffaloes.

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Sown Pastures for Queensland.

By C. W. WINDERS, B.Sc.Agr., Assistant (Agronomy) in the Agricultural Branch.

INTRODUCTION.

STATISTICS show that in Queensland an area of about three-quarters of a millon acres is under artificially sown pastures, and of this total the area carrying winter pasturage is but a few hundred acres. The grasses sown for summer grazing purposes are for the most part not native to Australia, but are introductions from countries experiencing climatic and soil conditions resembling those occurring in those parts of Queensland which are devoted to dairying and other semi-intensive grazing industries.

A large proportion of the artificially sown pastures established in the State is found in the coastal areas originally covered by rain forest or scrub. The rain forests correspond with rich basaltic and alluvial soils, and on such soils in areas with a rainfall of over 40 inches, such as the Atherton Tableland and those portions of the coastal fringe on which dairying is conducted, a South American native, *Paspalum dilatatum,* finds conditions suitable to its vigorous development. It should be remarked, however, that although *Paspalum dilatatum* has a rather high temperature requirement, its optimum appears to be lower than is provided by the climate of our tropical coast, for there it does not thrive too well, and grasses such as *Brachiaria mutica* (Giant Couch) and *Melinis minutiflora* (Molasses grass) are proving most useful under moist, tropical conditions.

In addition to the rain forests of the coastal areas there occur in the country lying between the coastal ranges and the crest of the Great Divide scrubs of a drier type. Softwood areas of this nature occur on basaltic soils and on rich alluvium, and in most of the settled districts the original timber has been felled and the land sown to *Chloris gayana* (Rhodes grass) for grazing by dairy cattle. Rhodes grass and paspalum have also been sown extensively after clearing of the heavily-wooded blackbutt forests lying close to the coast, and on the cleared sections of the brigalow scrub areas of Queensland Rhodes grass has been sown with good results.

The main features of the chief sown grasses and legumes, and hints as to the management of pastures are set out hereunder.

SUMMER PASTURE GRASSES.

Paspalum dilatatum. Poir.

A native of South America, *Paspalum dilatatum* is now widespread in many tropical and sub-tropical countries, and in Australia it is the chief dairying grass of the north coast of New South Wales, the south and lower north coast of Queensland, and the elevated Atherton Tableland in North Queensland. In habit it is a perennial, tufted grass with clustered erect stems and shortly creeping rootstocks by means of which a pasture of paspalum forms a sod. Though it evinces a preference for low, moist situations it has a wide range of adaptability to soil types, but the fertility and moisture content of the soil must be fairly high to support a good stand of paspalum. The drought resistance of paspalum is not very high, nor is its ability to withstand frosts, and as a natural

corollary of its moisture and warmth requirements paspalum makes almost its entire growth between October and May, with the maximum development during the hot wet months of January, February, and March.

Paspalum should be sown in spring or early summer either on fresh scrub burns or on ploughed and worked down land of reasonably high fertility. A seeding rate of 8 to 12 lb. per acre is recommended. Australian seed is free of the ergot which has retarded the use of paspalum in the United States and in South Africa, but the germination capacity is only fair and long-delayed germination is common. However, established paspalum plants produce abundant seed and a thin stand is soon thickened up by means of volunteer growth of paspalum. White Clover is one of the few plants which thrive in combination with paspalum, and seed of this species should be included in all sowings. *Lespedeza striata* is also of value in a paspalum pasture.

The feeding value of young growth of paspalum as shown by chemical analyses and by cream production is good, but as with all grasses the nutritive value falls rapidly with approaching maturity. Thus, typical analyses show a range from 20.6 per cent. protein, .412 per cent. phosphoric acid, and .618 per cent. lime in the case of leafy growth 6 inches tall, to 4.1 per cent. protein, .239 per cent. phosphoric acid, and .139 per cent. lime in the case of tall, stemmy growth.

Paspalum makes good hay and silage, and the excess feed produced in the flush months should, if possible, be conserved as hay or silage for use when required.

On many old-established paspalum areas there has been formed a more or less pure turf so stunted and sodbound that little feed is produced from the paspalum itself and conditions are too hard for any associate species, such as White Clover, to thrive. When this stage is reached it is necessary to break up the matted grass. On badly matted grass ploughing up the paspalum is perhaps the only satisfactory way of reinvigorating the pasture. This operation should be carried out during the rainy season of late summer, the sod being turned on its side and the land levelled off with the harrows. On areas not badly matted good results have followed treatment in early autumn by special paspalum renovators, which aerate the soil and remove loose and dead grass.

Rhodes Grass (Chloris gayana Kunth.)

Rivalling in importance *Paspalum dilatatum*, Rhodes grass is now grown over a wide area in Queensland and is the chief pasture grass in many districts too dry to support paspalum. It is a native of South Africa and has been introduced into cultivation in many tropical and warm temperate countries.

Rhodes grass is a perennial tufted plant with erect leafy flowering stems and spreading surface runners which root at the nodes or joints. From each node is produced leaves and stems, and so readily are the runners produced that a good ground cover is quickly obtained under favourable soil and weather conditions. Rhodes grass is primarily a summer grower, and under the present conditions of management produces little or no feed during the cooler months of the year. By appropriate means it can be induced to provide some green growth during the winter, however, provided severe frosts are not experienced. A rainfall of at least 20 inches per annum is required by Rhodes grass.

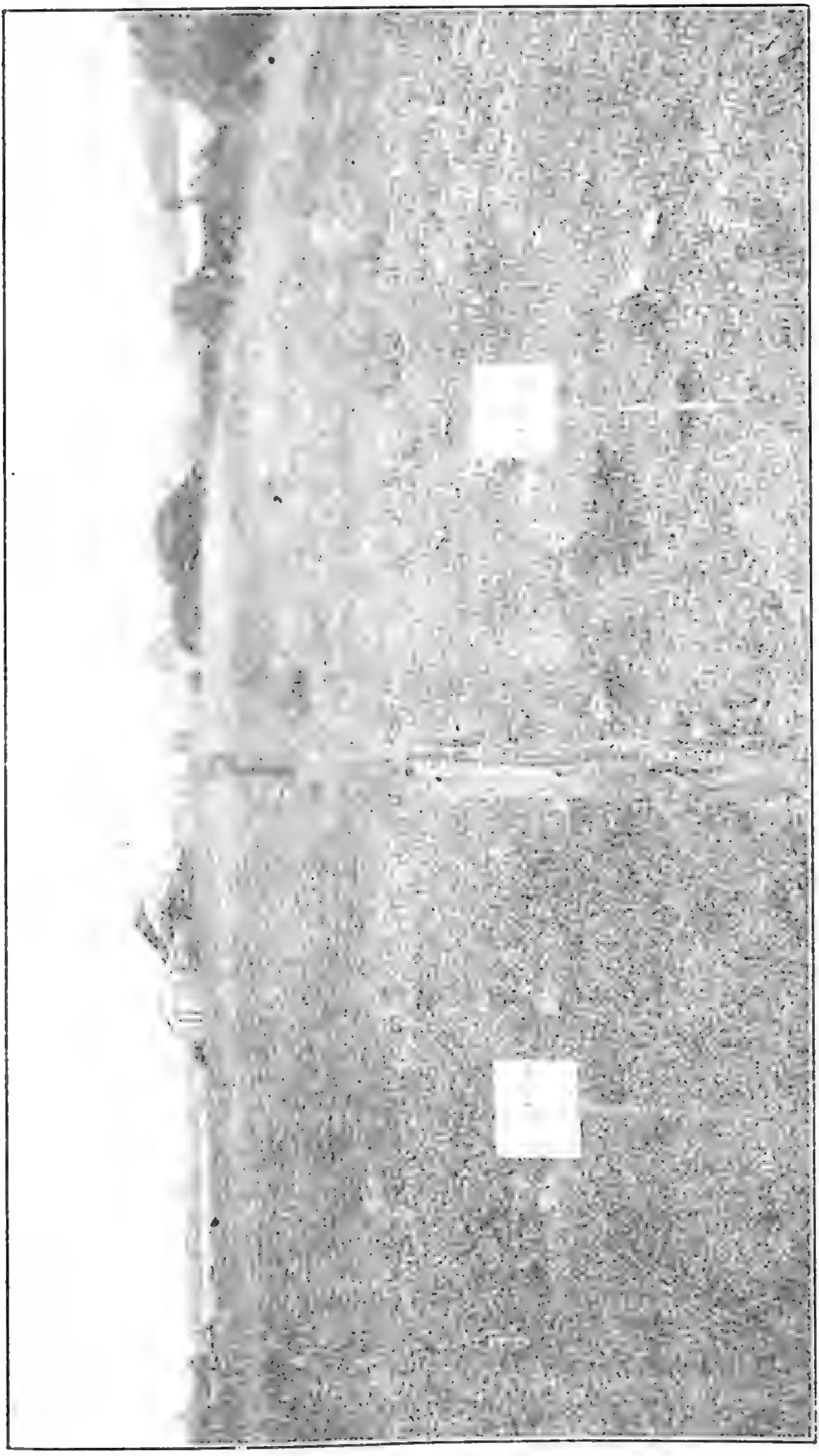


PLATE 185.

PADDOCK No. 1.—Showing Growth after First Grazing. A.—Without Fertilizer.
1½ cwt. Sulphate of Ammonia and 2 cwt. Super. per acre.

Spring and summer planting of Rhodes grass seed is best, since the young plants must be well established before the heavy frosts occur. Sowings from October to January usually give the best results. On scrub lands the ashes left after burning the felled timber provide an excellent seedbed in which the seed germinates quickly and the plants spread rapidly, but on forest country it is necessary to provide a good seedbed by cultivation. No useful results are obtained by simply broadcasting seed of Rhodes grass through native grass in ringbarked forest. The land requires to be ploughed, or at least worked by means of a spring tooth cultivator or disc harrows. Thorough preparation is essential if a long lived productive stand is to be obtained. Half-way measures are certainly better than no preparation at all, but after a very few years the pasture will require to be re-seeded if the requisite conditions are not complied with.

Rhodes grass is an excellent hay grass, the yield of hay per acre being high and the feeding value good if the grass is cut at the right stage. On every Rhodes grass farm a paddock should be reserved for hay purposes, two or three cuttings being made during the season.

Until recent years the central Burnett was the chief Rhodes grass centre in Queensland, but the areas have now been extended considerably in the Burnett and Dawson Valley districts, as well as on the Downs and Maranoa. In all these areas the grass has been sown principally on land cleared of Brigalow and light vine scrubs, from which it is spreading into ringbarked country and dominating the native grasses. The value of Rhodes grass on prepared forest country is becoming apparent, and its usefulness in the cotton rotation has been demonstrated.

Kikuyu Grass (Pennisetum clandestinum Hochst.)

Introduced from East Africa some years ago, Kikuyu grass has enjoyed considerable popularity amongst dairy farmers, though many old-established stands now appear to be declining in productivity, and owing to the difficult country on which many occur, cannot be reinvigorated by drastic renovation.

Kikuyu grass is a perennial which spreads rapidly over and through the ground by means of running stems. Both the surface and underground runners root freely at the nodes, anchoring the plant firmly in the ground and forming a dense turf which stands heavy tramping by stock. The creeping and erect stems carry a large quantity of leaf and the stems themselves are very succulent. Under good conditions Kikuyu grass makes a very dense growth, often as much as two feet in height.

In Queensland the grass has adapted itself very readily to varying climatic conditions. It does best under moist subtropical conditions, but will withstand a considerable amount of cold and keeps green in spite of fairly heavy frosts. For this reason it is very valuable as a late autumn and early winter grass. Its drought resistance is fairly good and some success has been attained on the western Darling Downs, throughout the Burnett, and in other sub-coastal areas. It is chiefly used at present in the moister dairying districts as an alternative, or as a supplement to, paspalum.

Kikuyu grass spreads most quickly and produces heaviest yields on loose, rich soils, and while it may and does provide fair grazing on some less fertile soils of a sandy or clayey nature, it is most advisable

to ensure a permanent stand by planting on fairly productive soils. Under special circumstances the grass is recommended for poorer soils, such as in rough places, or as a soil binder to prevent erosion.

The grass does not usually set seed in Australia (though in moist seasons it flowers well) and propagating material is obtained by dividing the crowns of well rooted plants, by cutting the rooted runners into sections, or by making cuttings of the erect stems. Each planting slip need only be a few inches in length, but must have one or two nodes. Planting should be carried out in spring or summer during or following rain.

If the grass is to be planted on land which can be ploughed, drills may be struck out three or four feet apart and the cuttings set a similar distance apart in the drills. The cuttings may be covered by hoeing earth on to them, leaving about one-third of the length out of the earth. Where the country is too rough to be worked the cuttings may be mattocked in and the soil firmed about each set by tramping.

Being a vigorous, smothering grass, Kikuyu is useful for planting in bracken-infested country. It should, however, be kept away from cultivation areas, and from areas likely to be brought into cultivation later, as it is extremely difficut to eradicate. In wet weather portions of the grass are often broken off by grazing animals and such pieces may be carried by the animals' feet to other portions of the farm.

Kikuyu grass is strongly recommended for pig pasture, as it provides all-the-year grazing in many localities and stands up to the rough treatment given by the pigs.

Para Grass or Panicum muticum.

Para grass (*Brachiaria mutica* Stapf.) is known in Queensland also as *Panicum muticum,* Giant Couch, or Bancroft grass. It is grown to a large extent in many tropical and sub-tropical countries, where it is a valued summed fodder grass. The grass is a rapidly growing perennial, spreading by means of stout runners which grow along the ground and root at the nodes. Vertical shoots are produced at the rooting nodes and reach a height of up to 5 feet. The runners spread very quickly, and the area occupied by the grass rapidly increases in size and in density of cover. So thick is the resultant stand that no other plants are able to grow vigorously in competition with Para grass. Stock are fond of both leaves and succulent stems, but the trampling of animals injures the runners, so under some conditions it may be advisable to cut the grass and feed it green, rather than to graze it heavily. The feeding value of Para grass is fairly good.

Para grass is proving most useful on the coast, as it is not very resistant to frost or drought. In North Queensland it has established a good reputation and is widely grown. It prefers wet or even swampy land and a paddock on a wet portion of most coastal farms might be planted with it to give a change from paspalum. Some success is reported from the Burnett district.

Seed of Para grass is usually of poor quality and not readily available, hence propagation by rooted cuttings is the usual method. These may be planted on ploughed land in furrows, with 6 feet between the cuttings each way, or started by mattocking in on the edges of waterholes or damp patches.

Molasses Grass (Melinis minutiflora Beauv.)

South America is the native home of Molasses grass, which was introduced into Queensland over thirty years ago. It is a perennial grass, creeping in habit, but often forming a mat of stems and foliage three to four feet in depth. It has a strong and distinctive smell due to the presence in the foliage of an essential oil. In addition the leaves exude a sticky secretion which is reputed to be repellant and perhaps fatal to ticks and mosquitoes. Stock at first show a distinct distaste for the grass, but in North Queensland at least soon grow accustomed to the grass and eat it readily enough.

Under moist tropical conditions Molasses grass is a very rapid grower, spreading quickly by means of creeping stems which root at the nodes, and smothering out other growth by the dense mat which it forms. The ability of the grass to cover a cleared area quickly, to the exclusion of weeds, makes it very valuable for sowing on burnt-over scrub areas on which weeds such as Red-ink plant come away very quickly.

As already remarked, the palatability of Molasses grass is not of a high order, though the nutritive value of short, leafy material is fair. The grass gives best results when kept grazed down and it is useful also as hay.

The seed of Molasses grass is exceedingly light, and a seeding rate of 2 lb. per acre is ample.

Blue Panic Grass (Panicum cymbiforme Hughes.)

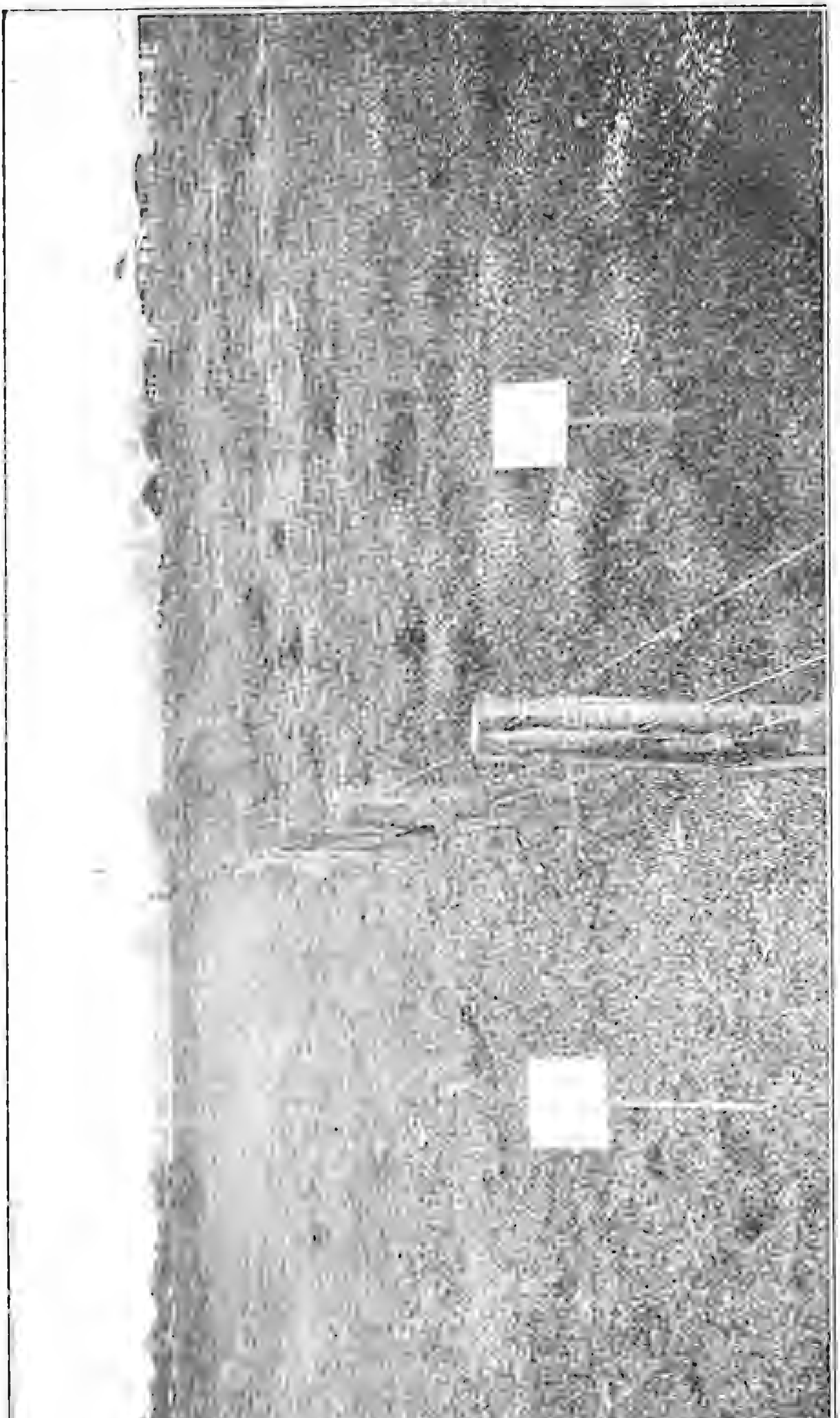
Blue Panic grass is a native of the northern parts of Australia and is also common on plains country in India. It is tufted grass with an exceptionally vigorous rooting system, forming strong underground stems from which it sends up succulent foliage stems, and later cane-like flowering stalks. By virtue of its root system it extends its area and is able to withstand heavy feeding and dry conditions. It is particularly valuable in dry localities, making good growth and remaining green when other native grasses are browning off. Heavy frosts cut the grass back, but light frosts do not interfere with the production of green shoots. Blue Panic grass is very responsive to light falls of rain and is eaten readily by sheep and cattle.

The feeding value of the grass is fairly good, but it must be understood that the nutritive value of a grass is at its highest when the plant is in the young leafy stage, and Blue Panic should be kept eaten down to prevent the formation of the cane-like stems. This suggests that the grass should be sown in small enclosed areas upon which stock may be concentrated in numbers sufficiently large to ensure that the grass is eaten at the correct stage.

As indicated above, the main usefulness of Blue Panic grass lies in its drought resistance, hence it is recommended for use in drier districts, such as the Burnett, Western Darling Downs, and Maranoa. Like that of many other natives, the seed of Blue Panic grass, unless very carefully selected, is likely to be unreliable as regards germination capacity. The grass establishes quite well from rootlets.

Guinea Grass (Panicum maximum Jacq.)

Guinea grass is a perennial, tufted grass, native to Africa, where it covers a wide range of environmental conditions and assumes many different forms. From Africa it has been introduced in most tropical



Paddock No. 4.—Showing Growth after First Grazing.
1 cwt. Sulphate of Ammonia and 2 cwt. Super, per acre.

Plate 186.

Paddock No. 3.—Showing Growth after First Grazing.
2 cwt. Super, per acre.

and sub-tropical countries, in many of which it is grown to a considerable extent as a cultivated fodder. The grass has been established in Queensland for many years and it is fairly common along the coastal strip.

In Queensland the plant grows in large tufts 2 to 6 feet high, and does not form a turf as do our better pasture grasses. Moreover, its tufty nature makes the use of a mower rather difficult. Nevertheless, owing to its fairly high feeding value and to the fact that stock relish it, Guinea grass is valuable both as pasture and as hay. For hay purposes it should be cut at the time of blooming.

Though best results are obtained on rich soil in high rainfall areas, the grass is fairly drought resistant and also makes some growth on poor soils, so its possibilities for various conditions are fairly good. A fair amount of seed is set, but owing to uneven ripening and easy shattering, much of the seed collected is of poor germination and propagation is best effected by setting out rootlets. These should be planted out 2 feet by 2 feet when rain falls in spring or early summer.

Guinea grass appears to be well suited to Far North Coast conditions and even in our paspalum country a paddock of it could be kept as a change of feed for the cows. In the Burnett and on the Downs small paddocks might similarly be established.

A note of warning should be sounded in regard to the indiscriminate use of Guinea grass, since it has been suspected on one or two occasions of causing death to animals by reason of the development of prussic acid.

Elephant Grass (Pennisetum purpureum Schum.)

In Africa, its native country, Elephant grass (or Napier grass as it is known there) is held in high regard as a summer fodder plant. In habit of growth it somewhat resembles sorghum, being tussocky and stooling freely. Under favourable conditions it makes extremely rapid growth, and when allowed to go unchecked often reaches 20 feet in a season. Stems more than a few feet high are, however, very hard and woody and unsuitable for green feed. The grass should be cut or grazed when less than 2 feet high, in which stage it is fairly nutritious. Growth after cutting is rapid.

Elephant grass is best adapted to the coast, sub-coastal and Downs areas. It is fairly drought resistant and is not affected by light frosts, though the foliage is killed by heavy or continued frosts. The stout underground parts are very hardy, however, and the plant responds quickly on the return of favourable weather conditions.

A well-drained soil is necessary to the best development of Elephant grass. Alluvials, scrub volcanics, and rich sandy loams are the best soils for the Elephant grass, though good stands may be obtained on less rich soils.

Seed of Elephant grass is not readily obtainable and propagation is effected by planting out root divisions or stem cuttings in rows of 5 feet by 3 feet. Furrows should be run out and the pieces of broken up stools or the 3-4 noded cuttings from mature stems dropped in the furrows and covered. The best time for planting out is following rain in spring or early summer.

Water Couch (Paspalum distichum L.)

The value of this relative of the common paspalum lies in its usefulness as forage in wet and muddy situations where more nutritive grasses usually will not thrive. There would appear to be considerable scope for the planting of Water Couch on areas which are occasionally flooded during the summer and which are bare mud holes in the winter, as well as in the swamps.

Known also as Knot grass and Joint grass, Water Couch is creeping in habit, developing numerous creeping stems which form a vigorous root system at each of the joints or nodes. This habit enables the grass to stand close feeding, but it also makes the plant a pest of cultivations, the stems forming a close mat very difficult to plough. The same spreading character causes the grass to be troublesome in bore drains, irrigation channels, &c., but aids it in binding banks.

The feeding value of water couch is fairly good, but planting should be restricted to damp situations where *Paspalum dilatatum* will not do well. Owing to its succulence, water couch turns blackish on drying, and consequently is valueless for hay. The grass grows best during the summer and autumn months and is cut back by frosts in winter.

Seed is not available commercially, but the grass is easily established by setting out rooted cuttings in the spring or summer.

SUMMER PASTURE LEGUMES.

A perusal of the foregoing list of summer pasture grasses established by artificial or semi-natural means in Queensland reveals a wide field from which selections to suit various purposes may be made, but, unfortunately, there is a paucity of legumes which may be grown in conjunction with the grasses. The choice at present is confined to lucerne, *Stylosanthes sundiaca* (Townsville lucerne), and species of Lespedeza from the Orient.

Lucerne (Medicago sativa.)

The value of lucerne as a hay and hay-and-grazing crop is well known and need not be reiterated here. It does seem pertinent, however, to draw attention to the use of lucerne alone or lucerne-grass mixtures as purely grazing propositions. Most sown pastures would be improved by the addition of a pound or so of lucerne seed per acre at seeding time. Paspalum swards generally will not hold lucerne, but a Rhodes grass pasture suitably managed should not oust a scattering of lucerne plants. With all winter pastures lucerne is an important ingredient from the coast to the drier dairying districts, and even in the semi-arid Maranoa, light sowings of lucerne seed have produced useful grazing pastures.

Lespedezas.

Three species of *Lespedeza*—all natives of the Orient—have been introduced into Queensland from the United States of America, where the value of at least two of the species has been proven. These two—*Lespedeza striata* (Common Lespedeza or Japan Clover) and *Lespedeza stipulacea* (Korean Clover)—are annuals, while the third, *Lespedeza sericea* (Perennial Japanese Clover), is a perennial.

The annual Japanese Clover is a low, spreading plant, single plants sending out numerous horizontal branches up to 18 inches in length, which form a dense carpet over the surface of the ground. The actual

height attained by the plant depends chiefly on soil conditions and ranges from four inches to eighteen inches. The chief use of this annual Lespedeza is as a grazing plant, but it has also been shown to make a useful hay and to be a good soil improver. It is a self-seeding legume, which thrives and spreads in native pastures as well as in paspalum swards. It is a summer grower which matures and sheds its seeds in late summer. It is fairly drought resistant, though its growth is much better in fairly moist places than on dry ridges. The seed may be sown in spring on cultivated land or broadcast on permanent grass and harrowed in. The plant is a heavy seeder and a small nursery plot would yield a good supply of seed for general distribution. *Lespedeza striata* is recommended for trial in coastal districts and on the Downs, Burnett, Lockyer, Fassifern, &c.

Korean Lespedeza is an earlier and coarser species than Japanese Clover, but the former is preferable under Queensland conditions where the long summer will allow of a long grazing period before maturity.

Lespedeza sericea has aroused some interest during the last two or three years, but its growth, being coarse and stemmy, is hardly suitable for grazing purposes unless eaten in the very young stage.

Stylosanthes sundiaca (Townsville Lucerne).

Revelling in hot, humid conditions, Townsville lucerne or wild lucerne has shown itself to be a particularly useful summer legume for coastal conditions in North Queensland, where it was naturalised many years ago. It is an annual plant, producing spreading prostrate stems which hug the ground for the most part, though they become more erect in a mixed pasture. Germination occurs with early summer rains—rarely before October—and if tall smothering grasses are absent, the young plants soon spread and form a dense mat of herbage. The period of full growth coincides with the hot, wet months of January and February, but the rank growth produced at this time is not relished by animals as much as the less luscious growth of March, April, and May. The plant is self-haying and is greedily eaten when dry; stock even scoop up broken portions from the ground. Thus a certain amount of palatable feed is provided well into autumn, when the plant finally disintegrates and is regenerated by seed. Seed is produced freely in the late summer, and the failure of the legume to become important south of Rockhampton probably is due to the shorter summer experienced in the south militating against seed production.

Townsville lucerne establishes and produces most freely on scrub country in tropical Queensland, but is also suitable for coastal grazing country kept well grazed and provided with a good rainfall. It is spread by animals scattering the seed in the dung or carrying the hooked fruits on their legs.

The feeding value of Townsville lucerne is quite good, though the fibre content of the numerous stems lowers the proportion of crude protein and minerals. The appearance of the legume in northern pastures should be welcomed as narrowing the nutritive ratio of the forage offered to stock.

WINTER PASTURES.

It will be evident from remarks made in connection with summer pastures that the growing season of such pastures is limited to the warmer months of the year, and that in the winter the summer pastures

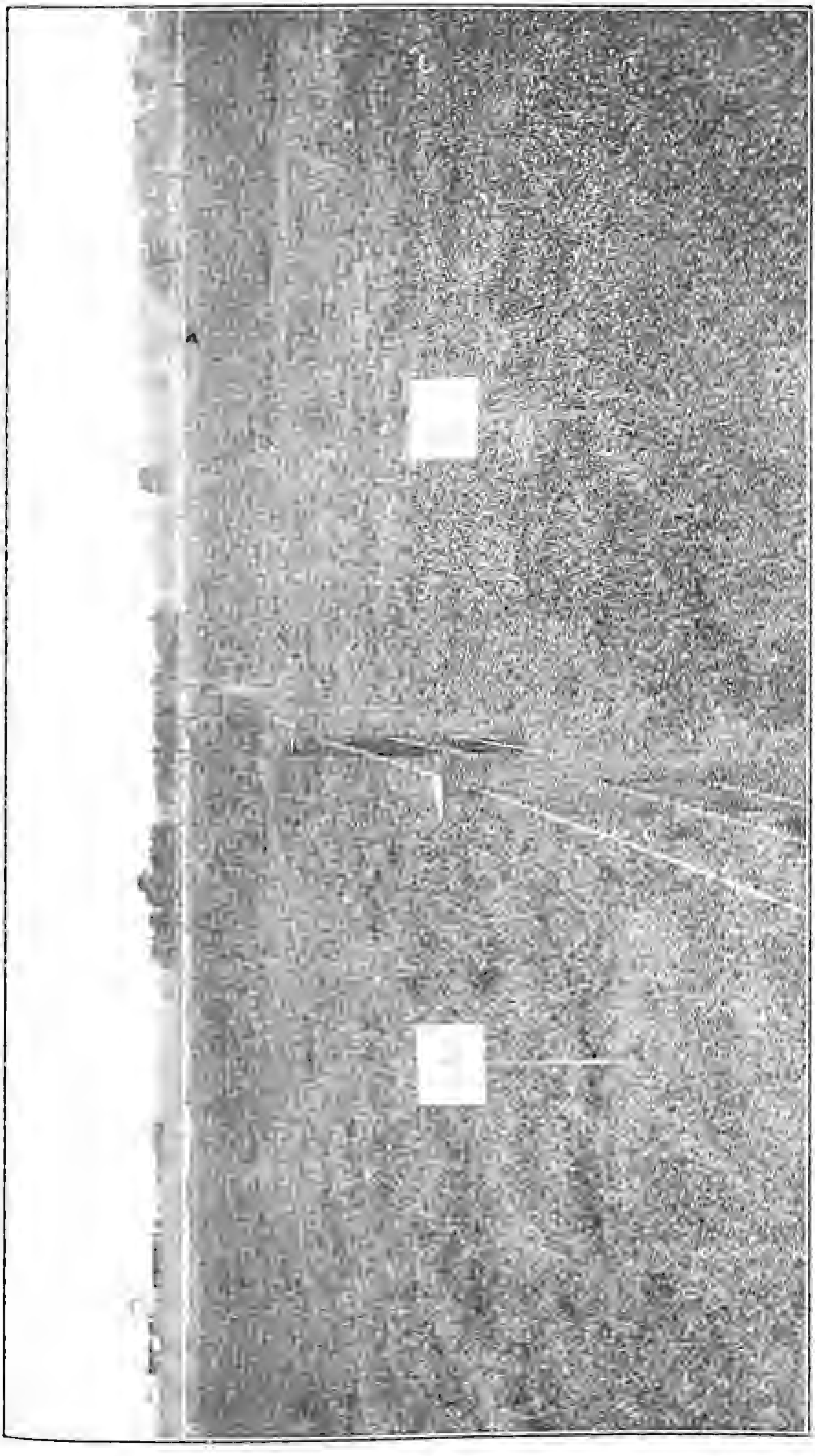


PLATE 187.

PADDOCK No. 5.—Showing Growth. Without Fertilizer.

PADDOCK No. 4.—Showing Growth after First Grazing. 1 cwt. Sulphate of Ammonia, 2 cwt. Super, and $\frac{1}{4}$ cwt. Muriate of Potash, per acre.

fail to maintain cows in profit, and fail to ensure a regular supply of fat stock to the markets. The dominating influence controlling pasture growth is that of climate, and it is due to climate factors, such as drought and frost, that the grazing value of a pasture varies so much from season to season. One means of evading the influence of the lean period, which extends from April to September in most years, is the provision of winter pasturage.

During the past few years a certain amount of exploratory work has been carried out along the lines of determining the suitability of various winter growing grasses and legumes to the soil and climatic conditions obtaining in different districts. Trial plots have been laid down by many farmers and pastoralists in co-operation with the Department of Agriculture and Stock and other bodies interested in pasture improvement work, and though many of the trials have not yet been carried out over a sufficient number of years to enable conclusive results to be obtained, yet they have provided deductions as to which pasture plants may be expected to show up well under a certain set of environmental conditions.

In the following notes are summarised the observations made upon various winter pasture plants.

Toowoomba Canary Grass (Phalaris tuberosa L.)

Outstanding among the perennial winter growing grasses is *Phalaris tuberosa*, a Perennial Canary grass, known also as *Phalaris bulbosa* and Toowoomba Canary grass. A native of the Mediterranean region, this relative of the canary seed of commerce was introduced into Australia over fifty years ago, being first sown in this country at the Toowoomba Botanic Gardens in 1884. Some twenty years later, seed from Toowoomba produced plants in Southern Australia which came under the notice of agriculturalists as possessing the advantages of drought resistance, permanency, high productivity, and adaptability to varying soil types. Though it has been tried in Queensland to a limited extent, the grass would appear to possess—at least in Southern Queensland—all the characteristics which have earned it a great reputation in other States; provided, however, that the rainfall during the seeding year is sufficient to ensure a successful stand.

The productivity of *Phalaris tuberosa* during dry spells is due first to the fact that its deep roots tap food and moisture resources not available to shallow-rooting plants, and second to the migration of nutrients produced during the flush period of growth to underground storage organs, this reserve being drawn upon as required.

As a consequence of its slow establishment, even when sown under the most favourable conditions, *Phalaris tuberosa* does not produce a large bulk of feed during its first year, and only two or three light grazings should be made in this period, the first being not less than about ten weeks after seeding. After the first year the well established plants will stand comparatively heavy grazing during the autumn, winter, and spring months, and the grass is also responsive to falls of rain during the summer months. A pasture of *Phalaris tuberosa* has a high carrying capacity, producing a large quantity of herbage, which, if fed off before the seed heads have emerged, has a particularly high feeding value and is extremely palatable. In habit the grass is somewhat like paspalum, and single plants may reach a diameter of 2 or 3 feet by means of short underground runners.

Phalaris tuberosa has performed very well on the Darling Downs, on the South Coast and Lower North Coast, in the Lockyer, and in the Fassifern, and there is every reason to expect that it will thrive in all the southern dairying districts and in the more humid of the sheep and cattle areas, provided it is sown on rich, well prepared land. A seeding rate per acre of 4 lb. is sufficient, and the seed should be mixed with fine dry sand for better distribution. Lucerne and Phalaris do well together, and 1 to 2 lb. of this legume should be included in all sowings.

It has been noticed that a stand of Phalaris is apt to decline in productivity if the soil becomes compacted by heavy tramping of stock; renovation by means of a tine cultivator will correct this tendency.

Perennial Prairie Grass (Bromus marginatus Nees).

Native to the Pacific Coast region of the United States of America, *Bromus marginatus* was introduced into Australia some years ago and has attained some prominence in New South Wales and in Queensland. It is an erect, tufted, leafy, somewhat coarse grass which makes its main growth in the autumn, winter, and spring months and lasts through the summer in the vegetative form, not as seed, as does the annual Prairie grass. The grass is a rapid stooler and produces an abundance of palatable and nutritious feed. No information is available regarding the length of time a stand of this grass may be expected to yield good grazing, but in Queensland Perennial Prairie pastures now in their third year are still producing well and show little sign of deteriorating.

Perennial Prairie grass should be sown at the rate of 15 lb. per acre, with a little lucerne mixed in. The grass seeds very freely, and from a small acreage a large yield of seed for distribution over larger areas may be obtained.

This grass is recommended for trial in all the dairying districts. Its use for sheep pasturage in closer settlement areas is also suggested.

Cocksfoot (Dactylis glomerata L.)

A useful, hardy grass for incorporation in permanent pasture mixtures in cool districts is available in Cocksfoot. This is a deep rooting grass of good feeding value, but is inclined to become tussocky. It makes good growth in spring, and so augments the major constitutents of the pasture at a time when other feed is scarce. The seed of Cocksfoot is often of poor germinating capacity and poor strikes are common.

Perennial Rye-grass (Lolium perenne L.)

In some of the more climatically favoured districts—such as Nerang and Maleny—the true Perennial Rye-grass, which is the basis of the wonderful dairying and fat-lamb pastures of New Zealand and the chief pasture grass of the old established pastures of Europe, has met with some success. It is, however, a fairly shallow rooting grass, and for this reason is not very resistant to the effects of dry spells. It would appear to have a limited sphere of usefulness in Queensland, success being likely to attend its sowing only in districts assured of regular falls of rain during the winter months, and there only on soils which do not rapidly dry out.

Italian Rye-grass (Lolium multiflorum Lam.)

While permanent pasture is undoubtedly the cheapest form of stock feed, there is nearly always a place in the farm rotation for an annual grazing crop, and where winter fodders such as Oats are successfully grown an area of Italian Rye-grass as a supplement, or as an alternative to Oats, is recommended. This rye-grass is in temperate countries a true biennial, but under our conditions it lasts only one season. It is a vigorous grass which comes away well from seed and stools profusely. It will stand heavy stocking and recovers very quickly after grazing. Three of four grazings of palatable, nutritious feed may be obtained during the winter and spring, or the grass may be grazed a couple of times and later cut for hay. Italian Rye-grass seeds freely and often a thick stand may result from self-sown seed. However, the grass is unreliable in this respect, and it is safer to sow it down each autumn. Some farmers make a practice of scattering a few pounds of seed through the rows of a maize crop at the time of final scuffling and so have a good crop of feed during the winter. During the severe winter of 1935 areas of Italian Rye-grass sown in the autumn at the rate of 10 lb. to the acre, together with 2 lb. of Red Clover, produced a dense mass of succulent feed in a number of districts.

Wimmera Rye-grass.

Almost as productive as Italian Rye-grass, but more drought resistant and earlier in maturing, is Wimmera Rye-grass. This, too, is an annual, but possesses the very useful property of ready self-regeneration from seed. That is to say, if the stock are kept off the first year's stand at seeding time the plants will shed an enormous amount of seed which will germinate with the following autumn rains and produce a vigorous new stand of grass. A harrowing in March would assist this reestablishment. Wimmera Rye-grass is possibly the most active in establishment of all the winter grasses, and fair stands are sometimes obtained by broadcasting the seed over native pastures and harrowing it in. It usually pays to cultivate for the grass, however, and under cultivated conditions Wimmera Rye-grass is able to produce abundant feed during dry winters. In sub-coastal areas, on the Darling Downs, and in the Maranoa, there appears to be much scope for such a grass, and a number of dairymen, sheep raisers, and cattlemen are exploiting it in dry areas. A seeding rate of 4 to 5 lb. per acre is ample, and the grass mixes well with lucerne. Two pounds of lucerne seed included in the mixture would produce a crop of lucerne which could be grazed during the summer with good results. Some cultivation of the area would be necessary to loosen the consolidated soil sufficiently to allow of the regeneration of the rye-grass.

Prairie Grass (Bromus unioloides H.B. & K.)

In the past, the annual Prairie grass has been perhaps the most favoured of the winter grasses grown in Queensland, but with better species available, the area under this grass will no doubt be considerably lowered in the near future.

Though there is no question of the ability of Prairie grass to establish itself, of its palatability and of its feeding value, nevertheless the grass fails to stand up to the critical test of heavy stocking. Moreover, the seed heads are often attacked by a smut and pretreatment of the seed

by pickling is advised. The destruction of the inflorescence by this smut prevents the natural regeneration of the grass from seed.

WINTER LEGUMES.

The question of pasture legumes suitable for winter grazing has not yet been fully answered, though trials over a number of years have narrowed down the field of possible successes to a mere half dozen.

Of these, lucerne takes pride of place as the legume best suited to the winter conditions over an extensive area, though it must be remembered that, while some winter production will always be obtained, the chief growth of this legume is made during the warmer months of the year. Lucerne definitely should be included in all winter pasture sowings in Queensland.

White Clover (*Trifolium repens*) is naturalised in many of the paspalum pastures of Queensland, and in certain seasons is particularly prominent. When the pasture is kept well grazed the white clover is small leaved and forms a close mat. It is usually considered that one year in every four is a good clover year, the paspalum at other times being completely dominant. The common White Clover, as well as the New Zealand certified type, does well in winter pasture mixtures on the coast from the border to Bundaberg. Stock are very fond of the clover in its young stages, but do not touch it after it has come into flower.

Red Clover (*Trifolium pratense*) is known also as Cowgrass. It is used in winter pasture mixtures, from which it has spread into paspalum pastures in moist southern districts. Stock do not appear to relish red clover, but in good seasons a bulky growth suitable for conversion into hay may be obtained.

Burr Trefoil, Burr Clover, or Burr Medic (*Medicago denticulata*) is an annual legume which has become naturalised in Queensland and occurs abundantly on downs country and on alluvial flats during winter and early spring, dying off with the advent of hot weather. In favourable seasons it produces a large quantity of feed which, if eaten green to any large extent, is likely to cause bloating. However, stock usually prefer this legume when it is dying off and they are especially fond of the ripe burrs which are shed in great numbers as the plant matures. From these burrs containing the seeds Burr Trefoil comes again in the autumn. The plant is not favoured in sheep country because of its burrs clinging to wool, but for general grazing purposes it is useful in as much as it is able to establish and spread in native pastures.

English Trefoil or Black Medic (*Medicago lupulina*) is somewhat similar to Burr Trefoil, but has not a spiny pod. It is much less abundant, being found chiefly in the coldest part of the State—the southern Darling Downs and the Granite Belt about Stanthorpe—in such localities its spread should be encouraged.

Subterranean Clover (*Trifolium subterraneum*) has failed to repeat in Queensland the wonderful success it has had in the Southern States, but trials are still in progress which may eventually reveal a set of strain, soil, climatic, and cultural conditions appropriate to its success.

ESTABLISHING PERMANENT PASTURES.

Soil Fertility.

In laying down permanent pasture it must be borne in mind that the pasture is expected to produce heavily over a period of years, and consequently some initial steps must be taken to ensure that the land is capable of supporting a productive pasture. With regard to softwood scrub lands it is well known that rich soils underlie such scrubs and the fertility of these soils is further improved by the practice of burning the unmarketable timber after felling. Moreover, such soils are, by their very nature, fairly well supplied with moisture. These factors of high soil fertility and abundant moisture enable fairly long-lived stands of pasture to be established by seeding the pasture on the burn, the seedlings establishing quite satisfactorily in the ashes. However, after the first few years of flush growth have been achieved the decline in soil fertility becomes reflected in a lowering of productivity of pasturage, and measures must be taken to restore some of the lost soil nutrients. In the case of mineral elements, particularly phosphates, this can be done by topdressing, but the application of artificial nitrogen manures is very expensive and the pasture should be broken up preparatory to building up the soil nitrate content by fallowing and/or green manuring. Unfortunately, a good deal of grassed scrub land is too rough to allow of ploughing being carried out, and here the stump-jump pasture renovator is proving useful in breaking up the soil sufficiently to allow air and moisture to penetrate and encourage the action of nitrate-producing bacteria.

Though there is every justification for the immediate sowing of pasture on freshly-burnt scrub lands, under no circumstances can the planting of raw forest and native pasture soils or worn out cultivation lands with permanent grass be recommended. The fertility of such soils must first be built up to the standard required by the particular pasture to be sown, and this is best effected by ploughing in green manure crops and by liming and applying artificial fertilizers if necessary. Green manure crops such as wheat and field peas, oats and tares, cow-peas, &c., will provide a certain amount of grazing before they are allowed to develop a good growth prior to ploughing under. Dressings of lime may be required to sweeten some soils, and under Queensland coastal conditions an application of 2 tons per acre of pulverised limestone may be necessary. Experiments indicate that many permanent pastures can be kept productive only by repeated applications of fertilizers.

Preparation of Seed-bed.

As indicated above, a long period of preparation of the land is essential for good results. Where a green manure crop precedes pasture in the rotation it should be ploughed in at least six weeks before the pasture is to be sown in order to allow ample time for the rotting down of the green material. Frequent workings of the area with harrows should be made to work the soil down to a fine tilth and to destroy weed seedlings. A fine tilth must be obtained prior to seeding, as most pasture seeds are very small and will not establish readily under rough conditions. Rolling the land prior to seeding makes a compact seed-bed in which both germination and establishment are encouraged.

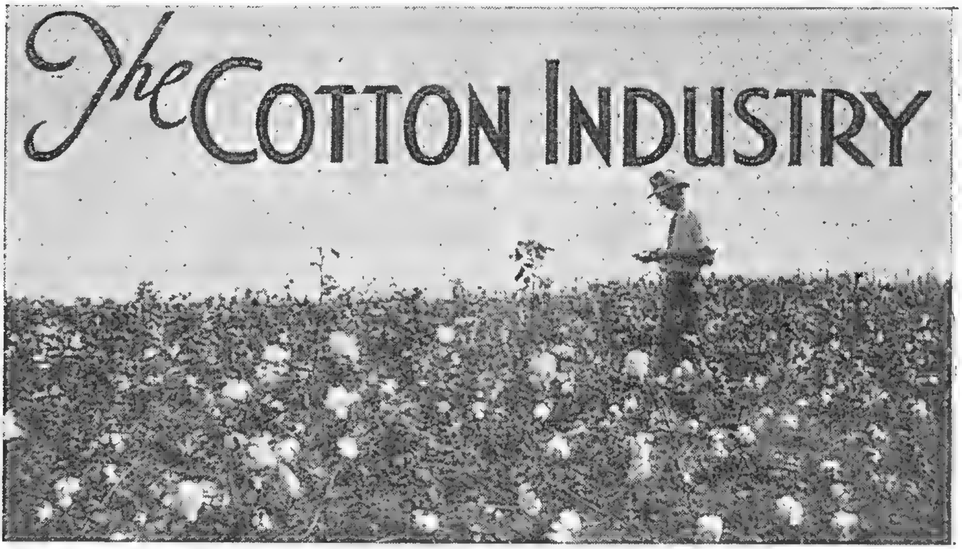
Methods of Sowing and Covering.

In most of the agricultural districts the only method of seeding pastures employed is broadcasting the seed by hand and covering with harrows. This method is quite satisfactory, and is indeed the only practicable method of sowing such seeds as those of Rhodes grass and Molasses grass. When sowing mixtures it is advisable to make two seedings, one of the grasses and the other of "shotty" seeds such as those of lucerne and clovers. In covering the seeds care must be taken that they are not buried deeper than about one-half inch. A light rolling or harrowing is sufficient. Except on some of the soils which cake on rolling, a light rolling after sowing is useful in compacting the soil about the seeds, but if the soil is somewhat dry, a harrowing should precede the rolling. A grain drill with a grass seed attachment is suitable for sowing grass seeds, but the seed must be sown shallow.

SEED QUALITY.

The first consideration in purchasing some pasture plant seeds is the source of the seed. So far as our chief grass seeds are concerned, these are produced locally for the most part. The bulk of the Rhodes grass seed comes from the Burnett district, and Paspalum seed from the Queensland coast and the New South Wales North coast. No great differences in the characters of the plants produced from different lines of seed are observed in the case of Rhodes grass, Paspalum, Molasses grass, or Blue Panic grass, and no special strains are available. With certain other plants, however, the source of the seed is an important consideration. Take, for instance, Perennial Rye-grass. Trials in Queensland demonstrated the superiority of certain New Zealand strains over other commercial lines, in so far as longevity is concerned. Many lines of so-called Perennial Rye-grass seed contain a large proportion of seeds of annual and other short-lived types of rye-grass, whereas much of the New Zealand seed carries a guarantee that such seed has been obtained from long-lived pastures, from pastures sown down with approved seed, or from pastures which are of a sufficiently high standard as indicated by Government Research Station field tests. Similarly, certified lines of seed of *Phalaris tuberosa,* Cocksfoot, Perennial Prairie grass, and White Clover are available and should be used when sowing winter pastures.

So far as purity and germination of seeds are concerned, the legislation dealing with the sale of seeds in Queensland is designed to afford the buyer every protection. Regulations prescribe the maximum proportion of foreign matter allowed in the various kinds of seeds, and the vendor is required to specify on an invoice the kinds of seeds, and declare the percentage of foreign ingredients to be within the prescribed limits. The Regulations set out the minimum percentage germination which vended seed must reach. Free examination of samples of seed purchased by farmers for their own use is carried out by the Department of Agriculture and Stock, and in any case of complaints regarding purity or germination, the buyer should at once send a sample of the seed, together with full particulars, to the Department.



CULTIVATION OF COTTON.

By R. W. PETERS, Cotton Experimentalist.

THE cultivation operations have an important influence on the yields which are obtained from a cotton crop, and also on the costs of production. Careful attention should be paid, therefore, to the factors bearing on each operation, and it is the purpose of this discussion to touch upon the various points one should study when cultivating a cotton crop.

Harrow Before Planting.

One of the most important factors is to harrow the seed bed into a good tilth after the planting rain, before sowing the crop. This not only assists in the establishment of favourable conditions for obtaining a good strike, but greatly retards germination of the weed and grass seeds. Where this is accomplished the cotton seedlings do not have to compete for the surface moisture, and thus have every chance of becoming established even if a dry period follows the planting rain. This elimination of early competition with other growths of seedlings undoubtedly is of great assistance to the young cotton crop. It is strongly recommended, therefore, where sowing in the dry soil has been practiced, that following the first rain afterwards a good cross harrowing be given before the cotton seeds start germinating, so that no damage will be done to the cotton, yet the young weed and grass seedlings will be destroyed.

Cultivate Early.

As soon as the rows are well defined, with the cotton seedlings around two inches in height, a thorough cultivation should be given as close to the rows as possible without covering the seedlings with soil. Where the work is done with a riding two-horse one-row machine, of the carriage rather than horse-steered type, the inner tynes, or teeth, as they are often termed, can be set within a few inches on either side of the row if the soil fenders are used to protect the plants from too much soil being moved against them. In most seasons this cultivation should establish a good mulch and check the start of weed or grass growth sufficiently

to enable the cotton seedlings to become well established. If showery conditions are experienced when the plants are around 4 to 5 inches tall, the most economical way to prevent grass and weed growth and re-establish the surface mulch, is to harrow across the rows with a spike tooth harrow with the teeth set at a slightly backward angle, so that they will not go in too deeply. This method will not only cheapen the cost of cultivation, but will tend to thin out the stand somewhat, which will be beneficial if a 15 to 20 lb. rate of sowing has been used. This method is only suitable, however, for land that is fairly free of surface trash, for considerable damage may be done by sticks catching on the teeth.

PLATE 188.

The first cultivation should be made when the seedlings are around 2 inches in height. Tines with fenders are the best equipment for this operation, as a good mulch is established close to the plants without damaging them.

Later Cultivations.

In many seasons it will not be necessary to cultivate more than once after the seedlings appear, before the plants are thinned. In some seasons, however, such showery conditions are experienced, especially in the wetter districts, that on old cultivations summer grass seedlings become established around the plants in the rows to such an extent that cross harrowing will not remove them. Where this occurs it is advisable, prior to thinning, to use the disc cultivators with the discs set to throw the soil from the plants to a depth of around three inches. This operation will cut away the grass and weed growth, and leave only a narrow strip of plants, weeds, and grass. With the crop "barred off" in this condition one stroke of the hoe will frequently remove the grass and weed growth, as well as any cotton plants it is desired to chop out, thus speeding up the work and reducing the cost of cleaning and thinning the field. As soon as the thinning is completed the field should be

cultivated by a tyne equipped machine with the inner tynes set to throw the soil around the plants, thus establishing a good mulch to reduce evaporation and brace the plants which are of a spindly type in places, due to the crowding where the seed has fallen in bunches. This moving of the soil back around the plants can be performed to better advantage with the 3-inch tynes, if the bolt which holds the tyne on is loosened enough to insert a piece of ¼-inch thick leather between the back of the tyne and the standard, so that the tyne will have a set which will enable it to function somewhat like a small mouldboard plough. In the case of large acreages the "barring off" cultivator should work just ahead of the thinners, and the covering up machine right behind them, for if the field is left until the thinning is completed before covering up, considerable drying out of the soil around the plants will result if hot windy weather occurs.

PLATE 189.

Illustrating the set of a disc cultivator for use in a weedy or grassy field prior to thinning. The discs cut away the soil, leaving a narrow strip of row which can be cleaned with mostly one stroke of the hoe. After the thinning the discs should be reversed and the soil thrown back to the plants. Weedy growth can also be controlled later in the season in the same way, when the plants are of the height in the illustration.

Cultivations After Thinning.

Generally speaking, not more than three or four cultivations should be required to control weed growth after the covering up operation following thinning. At each of these operations the fenders should not be used, for the soil should be worked to the plants to smoother weed growth and also to brace them, which will be of advantage during any high winds occurring when the soil is wet.

In some districts, however, such wet conditions may be experienced that crops under 2 ft. in height on old cultivations may be nearly choked out with summer grass before the ground dries out enough to allow of teams going on the land. Where this occurs the situation can be greatly

improved by working close to the row of cotton with a walking plough set just shallow enough to throw the grass away from the cotton, and yet not cut the roots of the latter. This not only reduces the competition with the grass, but also aerates the soil sufficiently to restore it to the proper condition for promoting the growth of the cotton. When the ploughed out grass has died another ploughing should be made to throw it back towards the row. Each season a good number of growers with small acreages of cotton on the old cultivations plough out weed-infested crops to plant later to maize or cow feed, when treatment such as has just been described, would save the cotton sufficiently to enable it to produce a better return than would be obtained from the other late sown crops.

PLATE 190.

A well cultivated field of young cotton. The surface soil is in splendid condition to absorb rainfall. It is advisable, however, on a slope like this not to run the rows down hill. If they are across the slope on an angle that gives them a drop of 4 inches in every 100 ft. of their length, and the soil is ridged up 3 to 4 inches high around the plants, less washing of soil occurs and better penetration of heavy rainfall is obtained.

Although a field may be clean, it is advisable, as long as it is possible to get a machine through the crop, to cultivate after each beating storm. After the plants are too tall for a riding machine the walking scuffler should be used, for very tall cotton can be worked if long traces are used with a spreader right behind the horse. If the ends of the spreader are wrapped with hessian, practically no damage is done even to the brittle branches, except where they have fallen across the "middles." This late breaking-up of the set surface caused by the beating mid-season storms, is important, for many of the older cotton cultivations tend to set very hard. Investigations carried out at the Cotton Research Station on fairly level country have demonstrated that only 34 per cent. of even soaking rains may penetrate the first six inches of cultivations which have had nine successive crops of cotton, while severe thunderstorms mostly run off into the low places in the field, causing very irregular

growth of plant. It is suggested that every grower practice this late cultivation particularly in fields on slopes. If the rows run across the slope, by ridging the soil well up around the plants and then practising late cultivation with the walking-scuffler, undoubtedly greater benefit will be obtained from the mid-seasonal storms than where the hard set surface is left for the water to rush off.

Clean Cultivation Helps to Prevent Insect Attacks.

The maintenance of clean cultivation in the cotton fields not only assists in the development of the plants, but also helps to prevent attacks from insect pests such as the cutworm and the corn-ear worm. The cutworm in the cotton districts away from the coast, mostly over-winters in the soil in the pupæ stage. With the advent of spring the moths emerge and lay under tender weed growth in loose soil. After the eggs hatch the young cutworms tend to spread outwards from the hatching place, feeding on the leaves of young growths of such plants as pigweed, bull-head, and cotton seedlings. The fallowed seed beds for the cotton crops thus make ideal breeding places in spring unless weed growth is eliminated not only in the field, but around the headlands. Fortunately the danger of cutworm attacks generally passes with the occurrence of hot humid conditions, so the maintenance of clean cultivation early in the season helps to confine cutworm troubles mostly to invasions from outside weed centres. These can be dealt with effectively by means of poison baits and furrows surrounding the field of cotton.

The moth of the corn-ear worm sometimes lays eggs early in the season on weed growth in the cotton fields, but the most damage is generally done in this respect after the danger of cutworms is past. Heavy laying of eggs of the corn-ear worm may occur on growths of pigweed in cotton crops during November and December, which makes it necessary that clean cultivation be maintained as long as it is possible to get the machines down the rows without seriously damaging the cotton plants.

Cultivator Equipment.

It is recommended that wherever the area of row cultivation on a farm will stand the overhead expense of a riding cultivator, one of the carriage steered type be purchased. More efficient work can be done with this type of machine than with either the rigid pole steered riding combination cultivator-planter, or the scuffler, and, of course, a greater acreage is covered per day than with the latter. There are several "makes" of this type of machine on the market, all of which enable the driver to steer the machine so accurately, if a well-gaited team is used, that the inner cultivating "teeth" may be set within a few inches of either side of the row. By the use of such cultivators and cross harrowing in the early stages, practically all hoe work is ordinarily eliminated except the thinning, and, prior to boll opening, the destroying of any tall-growing weeds, the seed of which would become entangled in the open cotton and lower the value of the lint.

These machines may be fitted with sets of discs for use when the field is grassy, or when it is desired to ridge up well at the "laying by" of the crop, as the last general cultivation is called; they may also be equipped with sets of tines for general cultivation.

Most of the standards or shanks on which the tines are bolted can also be fitted with other attachments, such as 6 or 8 in. sweeps or "duck-feet" as they are sometimes named. These cultivators can thus be equipped suitably for any kind of average farm crop row cultivation, and it is recommended that greater attention be paid to this important factor. Frequently machines are observed with the wrong equipment-discs being used when tines would do more efficient work; also tines are often used when sweeps or a combination of sweeps and tines would be much better. Tines are best suited for establishing a mulch, while sweeps are better weed eradicators unless the soil is of a heavy nature and too damp, in which case the tines will do better work, but should be followed up with sweeps if much weed growth is present, for the tines miss or slip off many of the weed roots. No one set of equipment will do all the operations through the season satisfactorily, especially if the crop is being grown on an old weed infested cultivation. Growers with large areas of cotton should particularly study this aspect of cultivation in order to reduce their costs of production by increasing the efficiency of each operation.

Conclusion.

The degree of efficiency of the operations connected with the cultivation of a cotton crop plays an important part in the returns that are obtained and the costs of production thereof. Much of the crop in recent years has been grown on comparatively new cultivations accompanied by relatively simple cultivation problems. With each season of cropping to cotton or other row crops, the increased growth of grasses and weeds necessitates that greater attention be paid to the points that have been discussed, to obtain the fullest efficiency in each cultivation given the cotton crop.

THINNING AND SPACING OF COTTON.

By W. G. WELLS, Director of Cotton Culture.

REPORTS that have been published in different countries presenting the results obtained in spacing tests of cotton all tend to indicate that, while the cotton plant has remarkable ability to adjust itself to environmental conditions, the order of merit of various spacings on any particular soil fluctuates markedly according to climatic conditions. It is advisable, therefore, that cotton growers should ascertain which spacing offers the greatest "factor of safety" to obtain a profitable crop under any of the ordinary climatic conditions likely to be encountered. A spacing that will produce excellent yields under favourable conditions, but poor returns under adverse conditions, is not suitable for sound farming practices, although the average results obtained from it over a series of years might compare favourably with all other spacings. Wide yearly fluctuation of production is the "curse" of all farming, for it complicates the actual marketing operations, and causes serious variations in prices.

Queensland Conditions.

It will be appreciated that spacings suitable for other countries may not be suitable for Queensland. Here, dry conditions usually are experienced in the late winter and early spring, and frequently the crop has to be planted on the bare minimum of favourable surface moisture. Early growth is generally slow until the thunderstorms start,

when rapid development of plant often occurs, particularly on many of the fertile alluvial clay loams of high nitrate content. Usually good production of flowers accompanies this growth, and where no serious losses result from insect attacks or severe climatic conditions, a profitable return may be expected. Severe corn ear worm attacks are often experienced, however, and where this occurs, if good rainfall follows soon, a rapid growth of plant generally develops which is accompanied by further loss of crop caused by insect attacks and physiological shedding. Extremely dry conditions may occur instead of wet ones, so it is apparent that the best spacing is one that offers the greatest chances of producing a profitable return under a range of conditions, although it may not allow of the production of the greatest possible crop a soil is capable of yielding.

Spacing Results Obtained in Queensland.

In the earlier periods of cotton growing in this State the practice was to space the plants wide apart, frequently on the square system. At the start of the present period of cotton growing most growers tried various row widths with the plants mostly around 2 ft. apart. As the growers increased the size of individual acreage the tendency arose, in an effort to reduce expenses, to plant lightly and not to thin. Two schools of thought thus developed, and in most seasons prior to 1925-26 sufficient growers could not be induced to conduct experiments to allow of the studying of the merits of different spacings over a comprehensive range of soils and climatic conditions.

Starting with that season, comparisons of 12 and 24 inch single spaced plants, thinned at different heights, were carried out with grower co-operators. Generally speaking, the results obtained, while varying according to soil and climatic conditions, indicated that thinning when the plants are 5 to 8 inches high tends to produce better yields than do later thinnings. In most of the experiments there was also a tendency for heavier bolls to be produced on the earliest thinned plants, although in some instances, the 14-16 inch height of thinning produced the heaviest bolls but the lowest total yield yer acre—the lighter crop allowing of more favourable conditions for the bolls matured.

In the 1925-26 season climatic conditions prohibited the experiments being planted until mid-November, but excellent rainfall was experienced after that which developed a good crop until mid-January, when a prolonged dry spell set in that lasted long enough to destroy the late middle and top crops of squares. In six out of nine experiments the 12 inch spacing thinned when 6 inches tall, outyielded 24 inch spacings at all heights. In the remaining three experiments, total yields of each were higher than those of the other six, and 24 inches, thinned when 6 inches tall, was ahead. The results would indicate that with a light crop the most plants per acre gave the best results, and where a good yield was obtained the wider spaced plants fruited heavier. No experiments were brought through with farmers in the 1926-27 season, but in the 1927-28 season, which experienced excellent climatic conditions and good yields were generally obtained, the results were conflicting from the limited number of tests completed. The climatic conditions in the 1928-29 season were most unfavourable for cotton. With the exception of a few small areas, planting was not accomplished until mid and late November. Erratic rainfall was experienced after that, some

districts receiving scanty amounts, while others were delayed. Many areas, particularly the Upper Burnett, Callide and Wowan districts, produced only a late top crop which was badly damaged by killing frosts at the end of April. The results obtained in the experiments were most unsatisfactory and of little value, although the few experiments completed mostly indicated 24 inch spaced when 6 inches high was ahead. No co-operative field spacing investigations were conducted in 1929-30, while the unfavourable climatic conditions in 1930-31 and 1931-32 prevented evidence being obtained from experiments, mostly crop failures being experienced in botn years.

Results in 1932-33.

In 1932-33 it was deemed advisable to test 6 inch spacing owing to the increasing tendency for growers with large areas to sow lightly and not thin the irregularly spaced stand obtained. Accordingly, single plants spaced 6, 15, and 24 inches apart were tried, and in three out of the four experiments carried out on cultivated soil in the Callide Valley, the 15 inch spacing was ahead. In an experiment in the new scrub burn of softwood, 2 ft. single spaced outyielded the unthinned hills spaced 2 ft. apart, by 80 lb. seed cotton per acre, the value of which would considerably exceed the cost of thinning.

Results in 1933-34.

With the cotton crops getting off nicely in the 1933-34 season following the wettest winter and spring conditions the cotton growers had experienced, greater interest was shown in spacing tests. In fourteen experiments completed that season—the 6 inch single spaced plants outyielded the 15 and 24 inch spacings by slight to appreciable amounts in nine experiments, with the 24 inch single spacing ahead in four, and the 15 inch in one test. Growth of plant was very slow and restricted throughout the season, the exceptional rainfall in the winter and early spring apparently leaching out the nitrates and compacting the soils to such an extent that there was no stimulation of rank growth of plant even in showery periods at mid-season, very few crops reaching 4 feet in height. Under the circumstances the closer spaced plants with fewer bolls per plant but greater boll producing area per acre yielded the best.

Results in 1934-35.

The spacing tests prior to this season had mostly been in Durango, the variety of the largest acreage. In the 1934-35 season it was deemed advisable to study the effect of 6, 15, and 24 inch single plant spacings in Indio Acala, the variety which appeared to have possibilities of replacing Durango on the alluvial soils; and Lone Star, which is the main variety for the soils of harder texture and low nitrate content. The season mostly favoured good growth of plant until mid-season, but from then on very dry conditions ruled in most districts, which severely checked further plant development. Only plants of moderate height—3 to 4 feet— were generally produced under such conditions, so that there was little tendency for rank vegetative growth. In seven experiments in Indio Acala, the 6 inch spacing was ahead once, 15 inch spacing 5 times, and 24 inch once, with the 6 inch spacing tending to have the tallest and most crowded appearing plants. In four experiments in Lone Star, the 15 inch was ahead or equal to the other two spacings, with 24 inch ahead of 6 inch in three experiments, and only slightly

behind in the other test, in which very low yields were obtained. In a similar test in the Cliett variety on brigalow soil, 15 inch was again superior, but in an experiment on a black heavy soil of the alluvial plain type, 6 inch was ahead in Durango, although 15 inch spacing had given the best results in previous years.

Results of Spacing Tests at Experiment Stations.

In 1923-24, which was a comparatively dry season, in a row and plant spacing experiment at Home Hill, consisting of 6, 12, 18, and 24 inch spacing in 3½, 4, 4½, and 5 feet row widths, 24 inch spacing was ahead in all row widths, with 24 inch by 4½ feet the best.

PLATE 191.

A culivated clean field speeds up the rate of thinning, thereby reducing the cost of this important operation. These plants average 6 inches tall, which experiments have demonstrated is the best height for thinning.

In the 1924-25 season this experiment was carried out at three Experiment Stations, Home Hill, Monal Creek, and Biloela. Under very wet mid-seasonal conditions at Home Hill, 6 inch spacing in 3½ feet rows yielded the best. At Monal Creek 6 inch spacing was ahead in each row width except 3½ feet, where 12 inch spacing was the highest yielding treatment of the experiment, 6 inch by 4 feet being next in order. Rather irregular results were obtained at Biloela under a long dry period occurring at the critical stage of crop development. The highest yields were, in descending order, 24 inches in 3½ feet rows, and 18 inches in both 3½ and 4 feet rows. There was no general trend, however, in each row spacing, so the results may not be reliable, particularly as the experiment was on new cultivation out of the virgin condition.

In the 1925-26 season the investigations were discontinued, except at the Cotton Research Station, Biloela, in the Callide Valley, where the research work has been centred since then. In a combined height of thinning and plant spacing experiment in rows 4½ feet apart, 24

inch spacing thinned when 4 to 6 inches tall, yielded the heaviest. Under the dry conditions the heaviest yielding treatments tended to produce the lightest bolls.

The experiment was repeated in the 1926-27 season, but, unfortunately, an insufficient number of plants were obtained in each of the 15 inch spacings to make the results indicative of that spacing. The 24 inch spacing was ahead, however, showing even the irregular closer spacing was detrimental. In the 24 inch spacing the plants thinned when 4 to 6 inches tall outyielded the later thinnings.

In the 1927-28 season, which was the best that has ever been experienced at the Research Station, spacings of 12, 24, and 32 inches thinned when the plants were 4 to 6 inches high, were tried in rows 4, 4½, and 5 feet apart. Plant growth was smaller than that of many of the previous seasons, being mostly around 4 to 4½ feet in height. Under the ideal conditions 12 inch spacing in 4 feet rows was significantly ahead of all other combinations. The 12 inch spaced plants significantly outyielded the 24 and 32 inch spacings in each row width, while the 24 inch spacing outyielded 32 inches.

The merits of planting on the square so that cross cultivation could be practised was studied in an experiment in which 1, 2, and 3 plants were left in hills spaced 3½ feet apart in row widths of 4½ feet. Three plants per hill outyielded the other two treatments. A similar result was obtained in the 1924-25 season at the Monal Creek Demonstration Farm under wet conditions in the first half of the season, and relatively dry ones in the latter half. Such rank growth of vegetative branches occurred in all treatments that cultivating had to be stopped before it was advisable. In a wet season the system has disadvantages, therefore, and the use of it may tend to develop serious weed and grass growth within a few years.

In a 24 inch spacing thinned when the plants were 6-8, 10-12, and 14-16 inches in height, the 6-8 inch height of thinning yielded the highest, but a slightly greater number of plants may have caused this.

1928-29 Season.

Adverse seasonal conditions delayed plantings until the 8th November, when irregular experimental stands were obtained following 90 points of rain. A prolonged hot, dry period throughout January checked plant growth seriously, and a late April frost completed a disastrous season. Many of the experiments yielded results, therefore, of little value. The plant and row spacing experiment of the previous season was repeated, but the irregular rate of germination spreading over three weeks seriously affected the results. The 12 inch spacing in the rows 4 feet apart produced the greatest number of flowers, but no significant differences were obtained between the yields of any spacings.

The height of thinning experiment in 24 inch spacing was repeated, and was likewise affected by the irregular germination, as well as a loss of terminals through a hailstorm. Daily flower counts on 120 plants in each treatment indicated, however, a marked superiority for the 6-8 inch thinning. The total flowers for the period of observation expressed in percentages resulted as follows:—6-8 inches—100 per cent., 10-12 inches—91.5 per cent., and 14-16 inches—77.8 per cent. Individual plant data collected from 60 plants in each treatment indicated that the earliest thinning gave these advantages:—A few more bolls per plant;

a slightly larger percentage matured by time of early frost; slightly more seed cotton than in the 10-12 inch treatment, and significantly more than in the 14-16 inch thinning; a higher percentage of 5 locked bolls of the total number of bolls borne per plant; and a higher percentage of 5 locked bolls in the bolls harvested.

1929-30 Season.

Damage from a severe corn ear worm migration affected the results obtained from all the row and plant spacing experiments so seriously that no significant differences were obtained. Generally speaking, however, the unthinned and closer spaced treatments in rows 4½ feet apart reacted more severely to dry conditions during the first half of the season than did single plants spaced 2 or 3 feet apart. Also in rank growing areas where run off water collected, the unthinned sections tended to make a tall spindly plant carrying very little fruit. In the latter part of the season late rains caused the formation of a light crop of bolls, and with abnormally late frosts a picking was obtained from the unthinned sections considerably in excess of what appeared possible during most of the season. With wet weather in mid-season a very rank growth would have probably developed in the spindly unthinned sections. The bolls of the unthinned plants were generally smaller than those of the 2 feet single spaced plants. Two feet spaced bunches of plants did not appear to be superior to unthinned cotton. The two feet single spaced plants had a good scattering of bolls throughout the plant and could have grown 1 to 1½ feet taller without excessive crowding. The 3 feet spaced plants were of too coarse a type and would have made rank growth had wet mid-seasonal conditions been experienced. Examinations of the rooting systems indicated that no thinning and spacing out to bunches every 2 feet markedly reduced the number and diameter of the large lateral roots, which would explain the lack of resistance of these treatments to dry conditions.

An experiment comparing 2 feet single spacing in rows 4½ feet apart and 3½ feet single plants in the same row widths, but cross cultivated, on newly broken up cultivation out of the virgin condition, failed to demonstrate any significant differences in yields. The same result was obtained in the 1, 2, and 3 plant per hill spaced 3½ feet apart in 4½ feet row widths. The dry conditions definitely checked the treatments with more than one plant per hill, so that the one plant treatment was able to produce more cotton per plant and thus make up for the smaller population.

1930-31 and 1931-32 Seasons.

Planting rains did not occur until mid-January in 1930-31, and drought conditions ruled in 1931-32, so that no results in thinning and spacing tests can be reported for these seasons.

1932-33 Season.

The only spacing investigation conducted at the Station in this season was testing the merits of thinning with an oscillating blade type of machine as compared to chopping out to one plant every 2 feet. The machine leaves bunches of plants of varying numbers, and 76 per cent. of the stand was spaced 12 inches apart or less. Under the somewhat dry, hot conditions of the season, competition reduced the yields of the machine thinned by 138 lb. seed cotton per acre. The length and strength of the fibre of the machine thinned was also significantly reduced.

1933-34 Season.

The wettest winter experienced in the district for sixty years ensured a complete restoration of subsoil moisture which had been deficient during the three previous severely dry seasons. Good timely planting rains enabled the crop to get off nicely, and frequent showers and cool temperatures enabled the plants to make slow, steady, satisfactory development. Dry conditions during January checked progress somewhat, but good rains followed, which renewed plant growth and formed a nice top crop. Under the unusual conditions small plants were produced all over the Station and surrounding district, and excellent yields were mostly obtained.

Plant spacing tests were carried out in Indio Acala cotton on both two year and nine year old cultivations, with the following results:—

SPACING TEST AND INDIO ACALA.

Unthinned.	1 foot Singles.	1 foot Bunches.	2 feet Bunches.	2 feet 2 Plants.	2 feet Singles.	Mean.
TWO-YEAR-OLD CULTIVATION. YIELD LB. SEED COTTON PER ACRE.						
1,156	1,302	1,227	1,244	1,177	1,097	1,200
NINE-YEAR-OLD CULTIVATION.						
908	1,150	1,101	1,024	1,087	1,037	1,051

In both experiments 1 foot single spacing substantially outyielded the other spacings, being 146 lb. ahead of unthinned on the two year old cultivation, and 242 lb. ahead on the nine year old. Chopping out to bunches a hoe width spaced either 1 or 2 feet apart was better than 1 or 2 plants 2 feet apart on the new cultivation, but not on the older one.

In the newer cultivation the unthinned treatment produced the shortest and weakest fibre, the three 2 feet spacings the longest, and the two 1 foot spacings the strongest. In the older cultivation 1 foot singles produced the best fibre considering length, strength, body, and drag. The fibre of the unthinned was of better general quality than in the unthinned on the newer cultivation, but still tended to be weak.

A plant spacing test was also conducted in the Mebane variety—a ranker growing, more drought resistant type than Indio Acala. Single plant spacings of 6, 12, and 24 inches in rows $4\frac{1}{2}$ feet apart on both two and nine year old cultivation, produced no significant differences in yields, although 12 inch spacing was slightly ahead in both tests. Plant examinations indicated the following significant differences:—On the newer cultivation the 12 and 24 inch spacings had heavier 4 and 5 locked bolls than did the 6 inch, and required fewer bolls to produce a pound of seed cotton. On the older cultivations the 12 inch produced the lowest percentage of diseased bolls, but there was no difference in the mean weights of the 4 and 5 locked bolls, and only a slight tendency for the 24 inch to require fewer bolls to produce a pound of seed cotton. The machine thinning test was carried out in the Durango variety on both five and nine year old cultivations. On the older cultivation the bolls of the machine thinned plants were smaller, but the greater number of plants per acre made the yields about the same—1,005 lb. seed cotton for machine thinning as compared to 983 lb. for the hoe spaced 2 feet

single plants. The lint of the machine thinned was, however, of a lower grade and more wasty. On the five year old cultivation there was a significant difference in favour of the hoe thinned—1,121 lb. seed cotton as compared to 848, the difference mostly being contributed by the first picking.

1934-35 Season.

The climatic conditions of this season were in decided contrast to those of the previous crop. Just sufficient rain was received to allow of plantings being made in mid-October. Exceptional rainfall occurring in mid-November forced rapid growth, however, but by mid-January all crops were heavily laden. Distress conditions mostly ruled after that, which checked further growth and caused shedding of the late middle and top crops.

The plant spacing experiment in Indio Acala was repeated with the following results:—

SPACING TEST AND INDIO ACALA.

Unthinned.	1 foot Singles.	1 foot Bunches.	2 feet Bunches.	2 feet 2 Plants.	2 feet Singles.	Mean.
THREE-YEAR-OLD CULTIVATION.						
YIELD LB. SEED COTTON PER ACRE.						
856	929	808	906	947	849	882·5
TEN-YEAR-OLD CULTIVATION.						
674	723	761	661	713	653	697·5

No statistically significant differences were obtained in either experiment—the severe late seasonal conditions levelling all treatment effects appreciably. With the small plants the 2 feet single spacing did not produce sufficient boll carrying structure, while in the closer spacings competition for moisture was too great. Two plants every 2 feet and one plant every foot did the best in the newer cultivation where the open texture of the soil trapped more of the mid-seasonal storms, which were of a hard beating nature, resulting in much run off. One plant per foot was also second best in the older cultivation where the mean yield of the experiment was 185 lb. seed cotton per acre less.

The effect of spacing single plants 12 and 24 inches apart, and 2 plants every 24 inches—the two plants being separated by 4 to 6 inches—was tried in the Cliett variety on three and ten year old cultivations. The yields indicated that the two plants per 24 inches spacing produced the best under the stress conditions on both cultivations. On old country the 12 inch spacing produced better than 24 inch singles, but the opposite was true on the newer cultivation, the yields being nearly exactly reversed. Durango was tested similarly on five year old cultivation, and the two plants per 24 inches spacing again led.

Tests of the lint obtained from all five experiments failed to demonstrate any significant treatment effect on the grade and quality of the fibre in any experiment, all being somewhat affected by the adverse conditions.

Conclusions.

The results obtained over the eleven seasons are not consistent and in several seasons an insufficient number of experiments were completed to allow of sound generalisations being made. The data obtained, however, would indicate, in a general way, that the following conclusions would appear to be warranted:—

1. The climatic, soil and cultural conditions affect the yields obtained from any spacing. As these are variable factors the relative order of merit of spacings likewise varies, which makes it necessary for each grower to test out likely spacings over a series of years, if the best spacing for his soils is to be ascertained.
2. Insect attacks cause a rank bushy growth in all spacings on fertile soils, if wet conditions are experienced following the attacks. Such growth tends to level the yields of all spacings.
3. In seasons experiencing wet conditions during the early and mid-growing periods, twelve to fifteen inch single plant spacings appear to be the best suited for fertile alluvial soils in the main cotton districts.
4. Dry periods tend to check plants of these spacings, however, so 20 to 24 inch single spacings are recommended for both the less fertile and less moisture retaining soils, particularly in the drier districts.
5. Wider spacings than 24 inches do not appear to improve yields and in wet seasons the vegetative growth that develops prevents proper cultivation being practised.
6. Unthinned, and bunches or hoe widths of plants spaced 12 or 24 inches apart—react severely to dry periods, have smaller bolls, produce shorter, weaker and more wasty lint, and have not outyielded 12 inch single spacing in the experiments. In dry seasons 24 inch singles have outyielded 24 inch unthinned plantings in the scrub burns, and also machine thinned bunches of plants spaced at varying distances of 12 inches and less on cultivated soils.
7. In wet seasons there is a tendency for a greater percentage of partially and totally diseased bolls to exist in the unthinned and closely spaced bunches, particularly on fertile alluvial soils.
8. Thinning when the plants are 4 to 8 inches tall generally assists in obtaining better yields and bigger bolls than do later thinnings. It is also easier to thin cotton at this height.
9. Undoubtedly it pays to thin cotton sufficiently to reduce competition during stress periods for increased yields of better quality may be anticipated over a series of years. Each grower will have to ascertain what spacing is the most reliable for his soils and the variety he is growing.

SEPTEMBER rains were over average throughout the southern agricultural areas, and have been followed by heavier storm rains during October. Some damage by hail was experienced in fruit, vegetable, and wheat lands, but apart from individual losses, the benefits derived more than compensate, as the favourable spring is reflected in increased butter production and the healthy condition of all summer crops.

As fodder reserves have been considerably depleted it behoves farmers to take full advantage of the good growing conditions by conserving fodder as hay or silage. Only in this way can winter production be maintained and stock carried through in thrifty condition. It is not generally realised that large quantities of hay and chaff are annually imported into Queensland even in good seasons, all of which trade could reasonably be secured by local growers.

Wheat.

This year harvesting will be later than usual owing to the generally late seeding and the recent heavy rains which delay the maturity of the crop. A wide variation of conditions exist over the chief wheat areas. In the east, from Toowoomba to Warwick, production will be low as many crops were fed off during the dry spell, to meet urgent requirements.

As the majority of wheatgrowers in this area are also dairymen or sheepowners, the crops were thus put to a useful purpose. In the Dalby district, production should be a record owing to the increased area sown, much of it being first or second year cultivation, and also to the more favourable mid-season rains. The Pittsworth district promises average returns, while at Bongeen, Irongate, and Yarranlea some excellent yields are in prospect from extensive areas. In the Maranoa prospects are also sound owing to the over average rains from July onwards.

Further rain is not required as it will be detrimental to crops. At the time of writing rust is not in evidence, but a spell of warm humid weather with further rain will certainly favour its development.

Plate 192.

Atherton, the centre of a progressive agricultural district in North Queensland.

Tobacco.

The September auction sale of Dalgety and Co. was the largest of its kind yet held in Queensland as approximately 155 tons of leaf were submitted to the buyers. Of this quantity, eventually 90 per cent. was sold at good value, especially considering the article submitted, as on inspection it was found that fully 40 per cent. of the consignment was either badly graded or consisted of immature leaf. Growers are again warned against the advisability of submitting immature leaf as the buyers will not even make a bid for these lines.

Another point which cannot be too strongly stressed is the irregular grading and baling of the leaf. When a bale is submitted containing mostly fair quality leaf together with a percentage of other grades, the buyer immediately places a valuation on it equal to the lowest grade in the bale as, until the bale is fully opened, there is no guarantee as to the percentage of the respective grades. In this manner, growers are losing pounds in their annual returns.

New season's operations are now in full swing and, although it is yet too early to make an estimate, it is expected that the acreage planted will be an increase on last season.

Sugar.

Beneficial rains were experienced in the far Northern areas during early October, and combined with warm temperatures, conditions have been favourable for rapid growth of the young crop.

The continuance of dry conditions in the Burdekin area is assuming serious proportions, both the growing crop and the mature cane suffering considerably. The estimates for the 1935 harvest have been reduced very materially due to the unfavourable conditions.

In Mackay, dry weather is seriously affecting crop growth, though light rains have been experienced within the past few days.

The Southern areas have received light though beneficial falls of rain, and the warm days of late October are ensuring rapid growth in the young crop.

General.

An increased acreage has been sown to early maize, particularly on the Eastern Downs, where wheat lands, previously fed off, have been ploughed and sown to maize, sudan grass, and sorghums. It is pleasing to note the increased interest now being taken in fodder production although its conservation for farm use as hay, and more particularly silage, is still at a low level.

Canary seed crops which were generally late sown should now be in excellent condition and return heavy yields. New season's onions have been reaching the market, chiefly from the Lockyer district, and have generally realised good prices. This is a crop which could well receive greater attention from local growers with a view to supplying a greater proportion of the State's requirements.

The success of the early potato crop is now assured owing to the excellent spring rains. Increased plantings are reported from the Toogoolawah district, while Downs plantings were later owing to seasonal conditions.

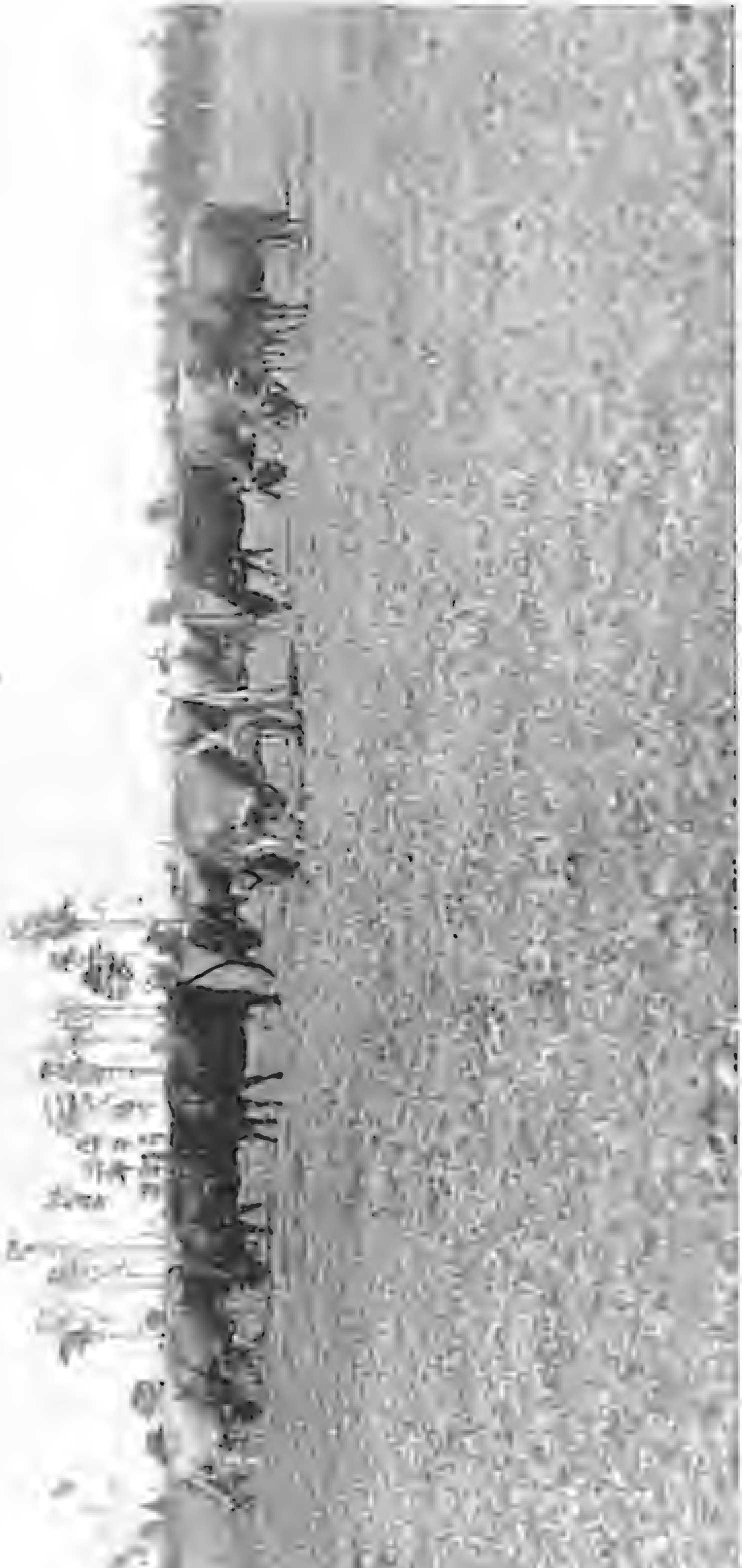


PLATE 193.
Dairy Cattle on Atherton Tableland.

In the Townsville district dry conditions still prevail although the far north coast has received ample rains. The Townsville average for the past nine months is very much below normal, resulting in grass and water becoming scarce throughout the district. Some maize for green feed is being grown under irrigation, but other summer crops await seasonal rains.

Mat Grass Control.

Owing to the spread of this grass and the resultant decrease in carrying capacity of dairy lands, a trial has been designed by the Pasture Improvement Committee, in order to ascertain the cheapest and most practicable method of replacing mat grass with more productive species.

Spraying with weedicides, ploughing alone, and ploughing followed by the planting of paspalum and smothering grasses such as kikuyu will be experimented with. Topdressing with fertilizers also presents possibilities and will be included in the experiment.

Peanut Industry.

The present postion is regarded as satisfactory as the bulk of the 1935 crop has been contracted for and the surplus from the previous crop disposed of.

The intake of the 1935 crop has been a record, 4,345 tons being received from 500 growers. The activities of the Pool Board have established the industry and are appreciated by both growers, manufacturers, and consumers generally as, although the Board receives all grades, its payments have surpassed those given by outside buyers.

Growers are advised to sow an increased acreage as if the present trade expansion continues a record production will be needed to meet Australia's requirements, which are about two-thirds Virginia Bunch and one-third Red Spanish.

SERVICEABLE HOME-MADE BRUSH.

A serviceable and cheap home-made brush can be made from a bunch of horse-hair, a short length of copper pipe, and a piece of wire. The accompanying illustration shows how the brush is made. Such brushes are extremely useful for countless jobs on the farm and in the milking shed.

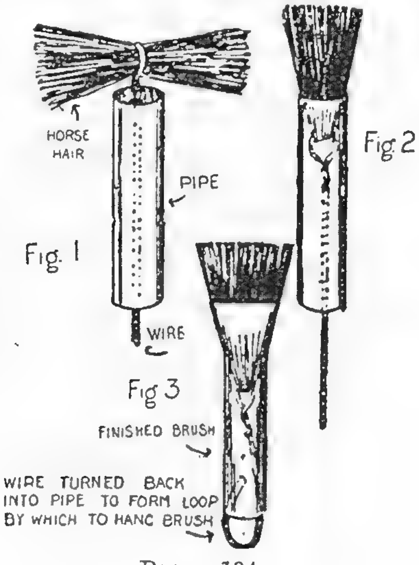


Plate 194.

PACKING BANANAS FOR MARKET.

By JAS. H. GREGORY, Instructor in Fruit Packing.

(*Continued from page* 484, *Vol. XLIV., Part* 4—*October*, 1935.)

IF care has been taken during all the operations of removing the bunches from the plant, transporting to the shed, and dehanding, little damage should have been sustained by the fruit. Careless handling will assist in introducing all manner of troubles. Plates 195 and 196 show illustrations of hands affected through bad handling, practically all of which could have been avoided.

It is a good plan while handling the bunch to gently rub the hand over the flower ends of the bananas in order to remove the dried flowerettes attached thereto, for if these are left on they make the pack appear untidy and unsightly; they should be removed before dehanding.

GRADE STANDARDS.

As with other commodities placed on the open market, certain rules of quality have to be observed. The family of the banana grower is amptly protected by laws governing weights and measures and standards of quality for foodstuffs and other things, and if such conditions are fair to growers, it is only right that commodities produced by the growers should also come under the same principle. To ensure this, grade standards have been framed as follows:—

Cased Cavendish bananas shall be divided into four grades—"Sixes," "Sevens," "Eights," and "Nines":—

"Sixes" shall mean sound fruit 6 inches to 6½ inches in length, with a minimum girth of 4 inches.

"Sevens" shall mean sound fruit 6½ inches to 7½ inches in length, with a minimum girth of 4 inches.

"Eights" shall mean sound fruit 7½ inches to 8½ inches in length, with a minimum girth of 4¼ inches.

"Nines" shall mean sound fruit 8½ inches and upwards in length, with a minimum girth of 4¾ inches.

PLATE 195.

SHOWING DAMAGE THROUGH CARELESS HANDLING, WHICH RESULTS IN BLACK END.

All measurements for length are to be taken on the outside of the curve, from the junction of the fruit at the stem end to the apex of the fruit. The girth is measured around the middle of the banana. (Plate 197.)

PLATE 196.
SHOWING DAMAGE TO STEM CONNECTION THROUGH CARELESS HANDLING.

These sizes should be adhered to strictly when packing. A good plan is to select a good average-sized fruit of the grade to be packed, and pack as far as possible all fruits that match this sample. When the packing of each case is complete, select the smallest fruit that can be seen in the case and mark on the end of the box the grade standard to which this particular fruit conforms. While packing, eliminate all inferior fruits such as those damaged by bad handling or insects or affected by cigar end, and also twin bananas, immature bananas, and those with damaged shanks. Some striking examples of types which should not be packed are shown in the illustration (Plate 198). Here again care should be the watchword, as the inclusion of only a small quantity of this type of fruit would spoil the chance of receiving top market prices.

BULGE.

An oft-debated question is what is the correct bulge to place on the finished pack. Packing so as to obtain a bulge of from 1 to 1½ inches on the lid when nailed will prove most satisfactory. An examination of the case will then show a bulge on the bottom boards approximately two-thirds the size of the top bulge provided that a good type of timber is used. Sweating the fruit before packing plays its part in the correct bulge to use.

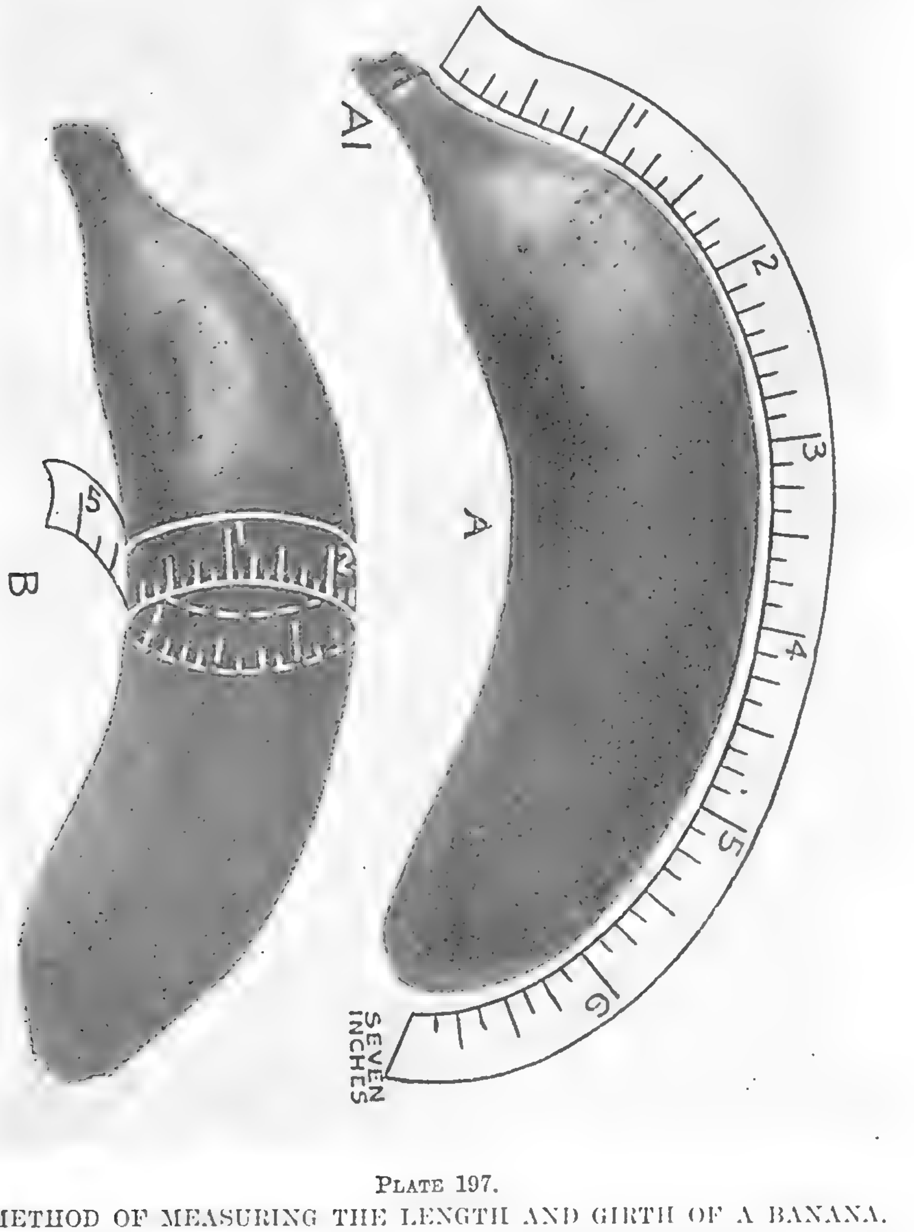


PLATE 197.

METHOD OF MEASURING THE LENGTH AND GIRTH OF A BANANA.

A.—The length of the fruit is taken from the raised girdle (A1) to the centre of the end;

B.—The middle of the banana is where the measurement for the girth is taken.

SWEATING.

Observations made with freshly picked fruit and fruit sweated for thirty hours showed interesting characteristics. Cases were packed with a bulge of from 1½ to 2 inches with both sweated and unsweated fruit and the lids nailed on. An inspection twenty-four hours later

PLATE 198.
SHOWING DAMAGED FRUIT UNFIT FOR PACKING.

showed that the freshly-cut fruit was badly lid-bruised, some specimens being slightly squashed and split; ten specimens were so damaged as to be unmarketable. The sweated fruit, however, showed no markings from the lid pressure bad enough to spoil the fruit for market.

The sweating tends to toughen the fruit and it stands up better to pressure. The above test was made in July with normally warm weather prevailing. Hot weather conditions when handling would of necessity mean a reduction in the period of sweating. During hot weather, fruit picked one day should be packed the next, being spread out during the intervening night to permit its becoming thoroughly cooled. Hot plantation fruit, if immediately packed into cases, would be slow in losing its heat, which would not assist towards good carrying. In summer the aim of all growers must be to keep the fruit cool, while in winter every endeavour should be made to keep it from being chilled. To this end the cased fruit should in summer have the paper torn at all the side openings, while in winter it should be left unbroken.

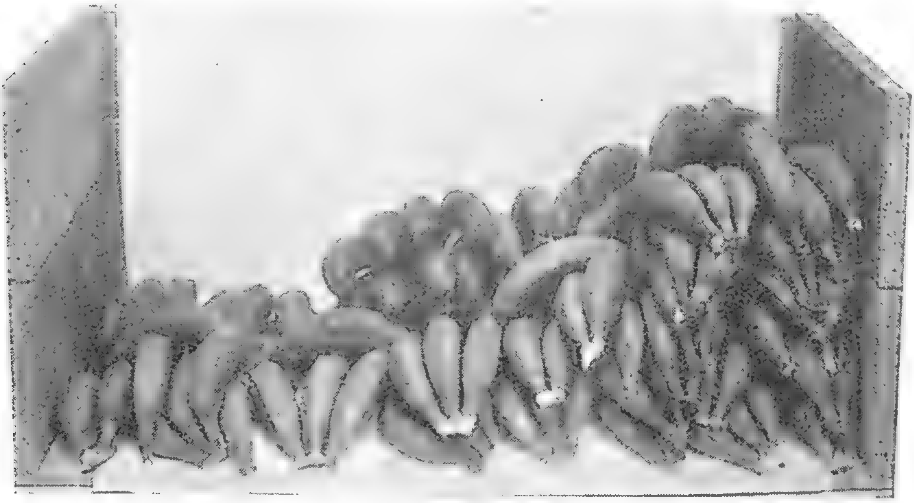


PLATE 199.

INCORRECT WAY OF PACKING.—One layer of fruit should be completed before commencing to place the next layer on top of it.

PACKING.

In years gone by, many types of packing were used in casing bananas, full-hands, part-hands, and fours being quite common on the market in Melbourne and Sydney. At that time Brisbane was supplied with bunch fruit. Modern marketing and ripening practice, however, has brought about the recommendation from the wholesalers in the Markets to pack in singles. This, of course, did not entail any extra work for them, but it increased the growers' work three-fold and at the same time brought in factors which made the risk of damage and infection from disease during handling much greater. Here again the extra risk must be carried by the grower, while at the same time there has been no noticeable increase in returns for the extra time and labour involved. Observations made of the ripened fruit in various packs has shown that singles are much more seriously affected by Squirter and Black-end than hands or part-hands. (*Bulletin No.* 64, *C. S. & I. R.*). As this state of affairs might not always continue, many of the different packs that can be used are included in this description of packing.

No matter what particular pack is used by the grower, every care must be taken during all operations. All packing must be completed layer by layer until the case is full. The part-hand packed case

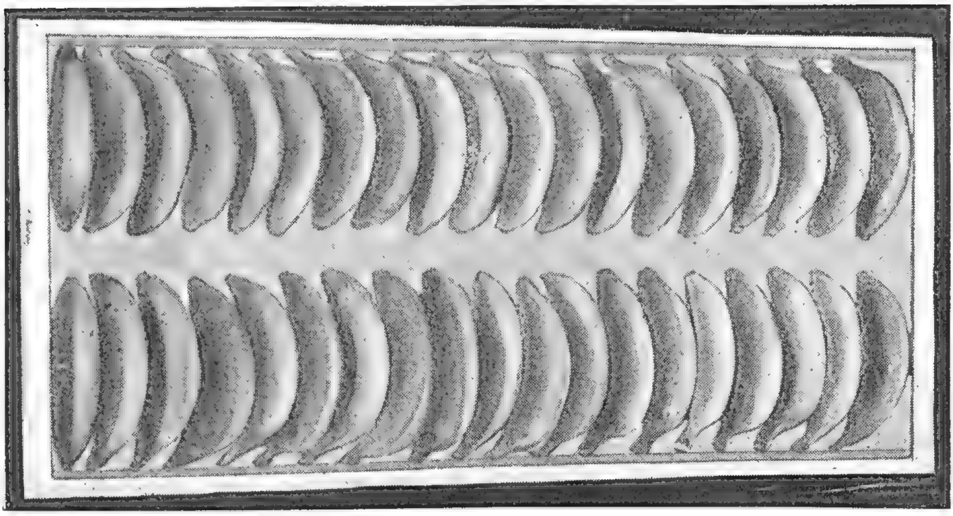


PLATE 200.
METHOD OF PLACING FIRST LAYER OF "SIXES," "SEVENS," AND SMALL "EIGHTS."

illustrated (Plate 199), is an example of how *not* to do it; here it will be noted that there is only one completed layer, three other layers being placed on top of this in various stages of completion. Packs done in this manner, whether in singles, twos, or part-hands, must inevitably be unsatisfactory. A good foundation is the secret of good packing, so the importance of finishing each layer so as to make it a good foundation for the next layer cannot be too greatly stressed. The correct pack to use for fruit is governed, of course, by the type of bunch being cut. A close study of the illustrations of the respective packs will guide the packer over many pitfalls.

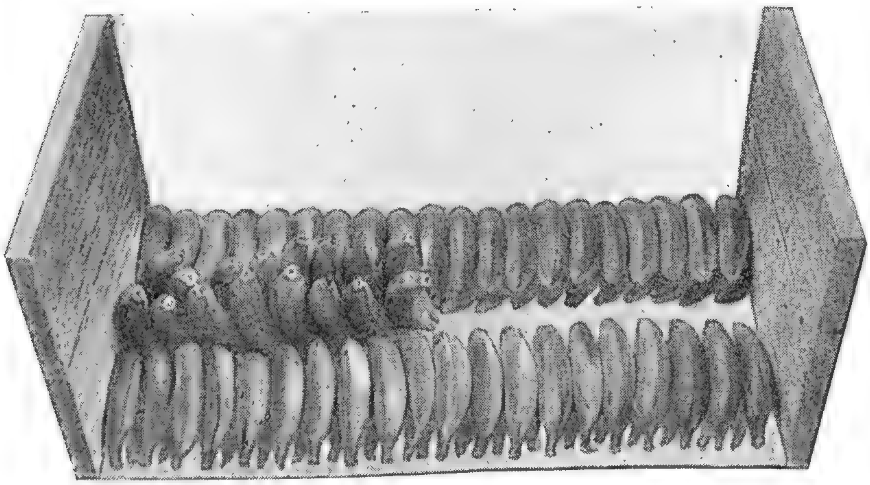


PLATE 201.
METHOD OF PLACING SECOND LAYER.—Fruit should be placed in the spaces of the first layer, concave downwards.

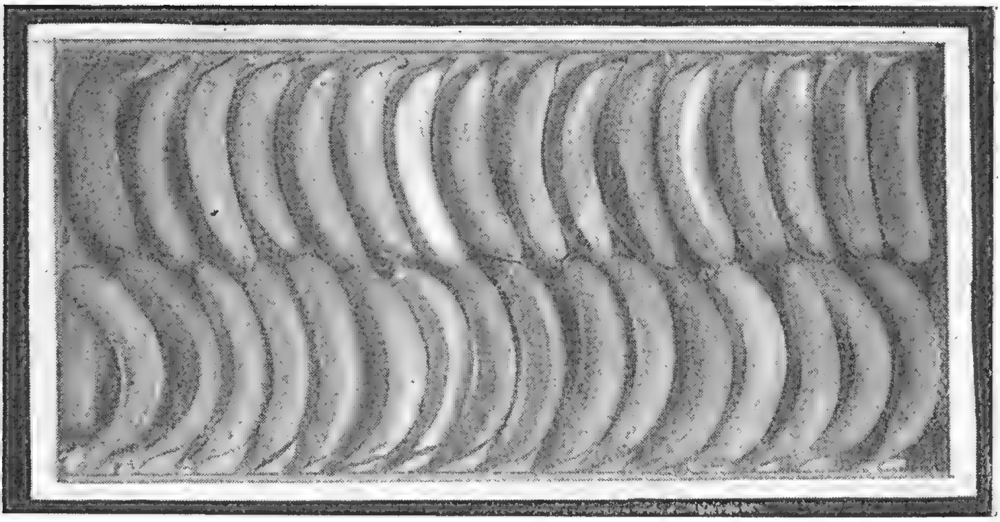


Plate 202.
METHOD OF PLACING FIRST LAYER OF CURVED "EIGHTS."

Single Packs.

There are various ways of packing bananas in singles, the best of which are shown. The pack most commonly used is done as follows:—

A layer of fruit in two lines is placed along the bottom of the case, each banana being placed on its side (Plate 200), with the shank end of the fruit touching the wood of the side boards of the box. The layer is completed from end to end, the fruit being kept compact and firm in order to form a good foundation for the succeeding layers. The second layer is placed upon this, concave downwards (Plate 201), the fruit being placed in the spaces between the fruit of the first layer. The third layer is placed in the spaces of the second layer, and the case

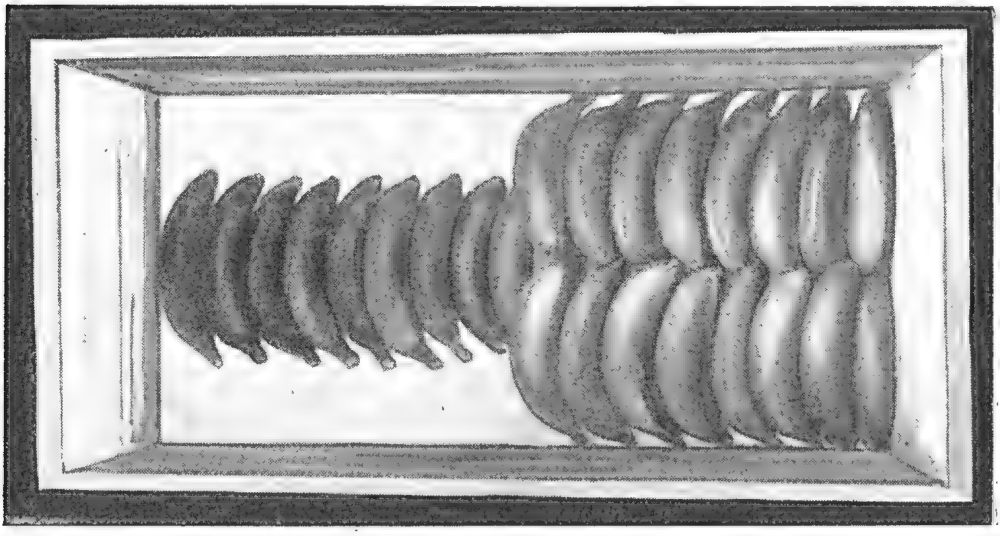


Plate 203.
METHOD OF PLACING FIRST LAYER OF LARGE "EIGHTS" AND OF "NINES."

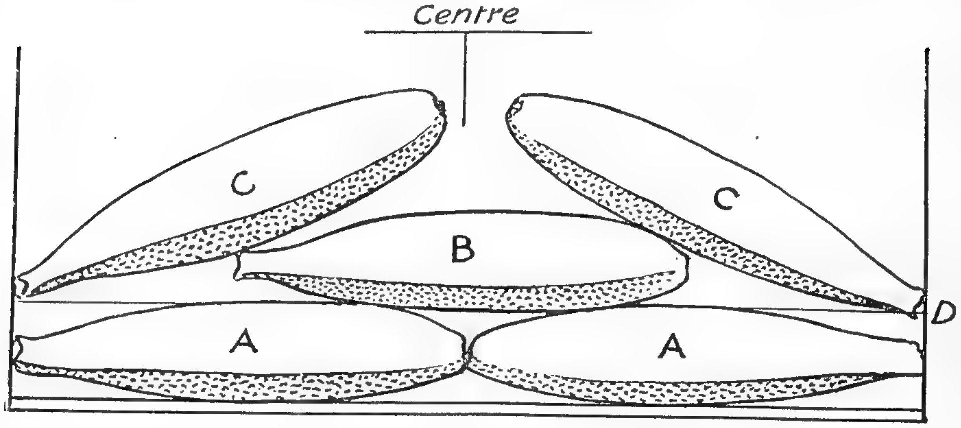


PLATE 204.

END VIEW, SHOWING THE PRINCIPLE USED WHEN PLACING THE SINGLE LAYER DOWN THE CENTRE OF THE CASE TO ENABLE "NINES" TO BE PLACED ACROSS THE CASE.

A.—Two bananas placed across the case just fit.

B.—Represents the line of fruit placed down the centre of the case.

C.—The first layer placed in position. Note the extra length gained by lifting the centre of the layer with B.

D.—Represents the bottom of the case.

finished accordingly layer by layer, placing each layer in the spaces of the layer beneath. Where a quantity of fruit is at hand, it is advisable to keep, as far as possible, to a type of fruit that will fit evenly one upon the other. If a curved type is being packed, all straight fruit should be used as fillers or key bananas, or, if a sufficient quantity of such fruit is available, it should be packed in a separate case. Packers will find it easier to do good packing if they have ten to twenty cases to do than if they have only five or six. The packing of "Sixes," "Sevens," and small "Eights," is commenced in the manner described above.

"Eights," if they are a curved type of fruit, should have the first layer placed in the form of an "S" (see Plate 202).

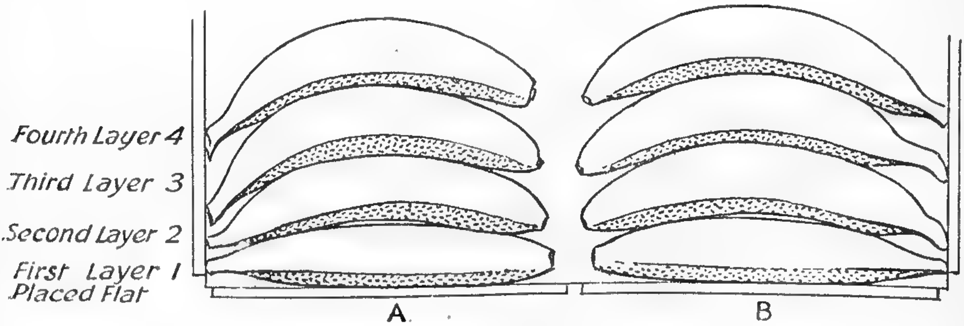


PLATE 205.

CASE WITH END REMOVED, SHOWING CORRECT AND INCORRECT METHOD OF PLACING FRUIT.

A.—Correct method, with shanks of fruit placed well down the side of the box.

B.—Incorrect method, showing layers of fruit packed without placing the shanks well down the side of the box.

"Nines," owing to their extreme length, are started in a slightly different manner. With this size of fruit a line of fruit is placed down the centre of the case, and on this the first layer proper is placed on its flat (see Plate 203). Plate 204 illustrates the principle used in the pack, succeeding layers being placed concave downwards similarly as is done for "Sixes" and "Sevens." When placing the second and successive layers, care should be taken to place the shank end of the fruit well down the side of the case (Plate 205). This takes most advantage of the natural curve of the fruit in order to mould the pack into a solid mass. Failure to do this allows the fruit to vibrate whilst in transit and causes damage to the centre layer of key bananas or to the ends of the fruit in the centre of the case. This damage is increased by the method of stacking the cased fruit on its side whilst in transit owing to the bulge in the lids and bottoms, causing the fruit to travel to its destination in a vertical position.

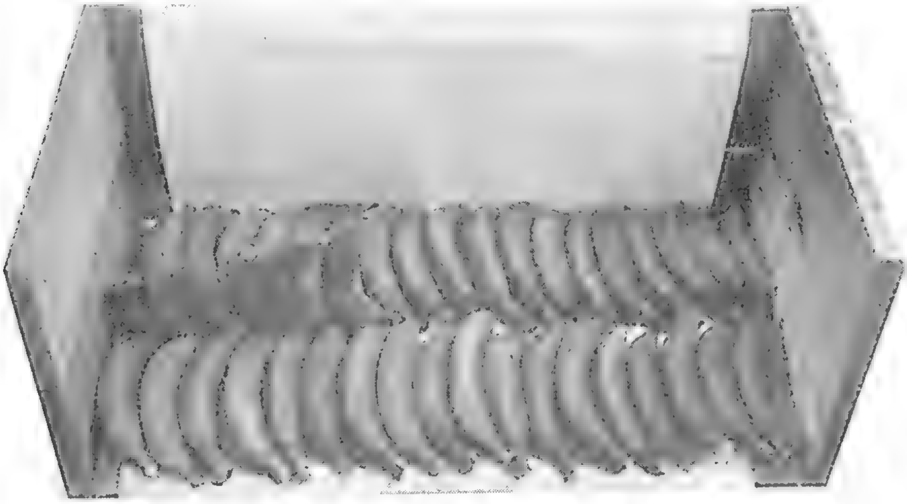


PLATE 206.
SHOWING PLACING OF CENTRE BANANAS.

Straight types of fruit are packed on the same principle as curved fruit, but using the pack for the next size larger of curved fruit.

"Sixes" and "Sevens" require to have the centre of the cases filled with key bananas in order to tighten the layers. The best method of using key bananas is to place them with the stalks downwards in between the lines of fruit in the centre of the case, care being taken not to bend the stalk end. (Plate 206) Where two layers placed vertically do not reach the top of the case, the centre layer can be finished off by placing the balance of the key fruit end to end in the case as in the left-hand case shown in Plate 207. Tightness of the key bananas is essential for success. Experiment has shown that the vertical method is the better for ensuring a tight centre to the pack.

Single Alternate Layer Pack.

Another type of single packing which is used is the alternate layer pack. This is started in the same manner as other single packs, with the first layer of fruit placed on its flat. The second layer is then placed upon the first layer (Plate 208) but the curve of the fruit is reversed.

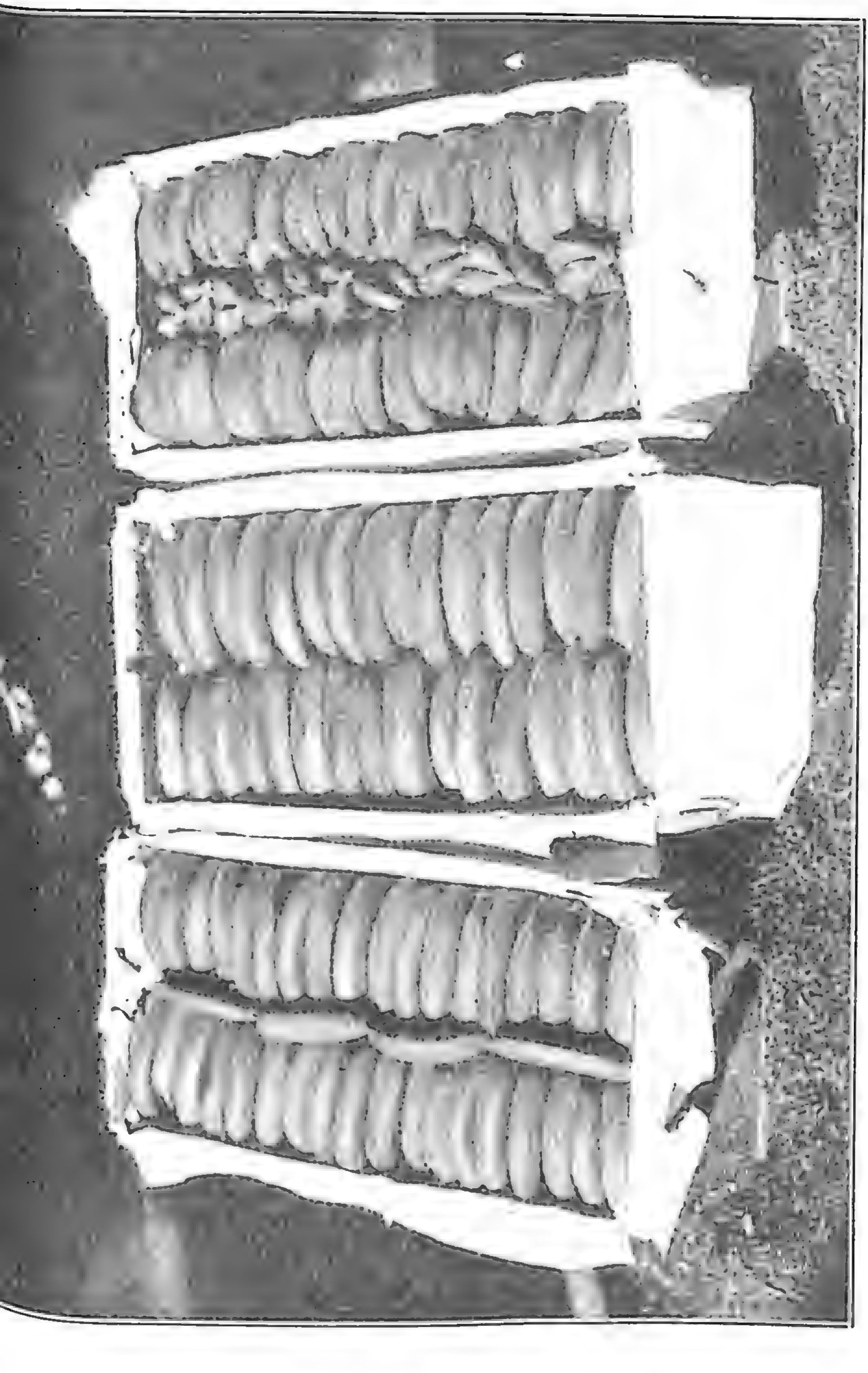


PLATE 207.
THREE CASES OF BANANAS OPENED IN MELBOURNE.
Note the placing of the centre bananas.

With care, each layer rests in the cracks between the fruit of the layer it rests upon. The pack is finished by reversing each alternate layer. This pack, being very solid, does not need to come as high in the case as the ordinary single pack.

Some Brisbane ripeners have raised objections to this pack that it does not contain enough fruit. However, a comparative investigation shows that there is but little difference either way in well-packed cases. The fruit ripens quite satisfactorily, and as the pack is quite easy to do, it has features to commend it to the beginner. Consignments sent to Southern Agents have proved satisfactory.

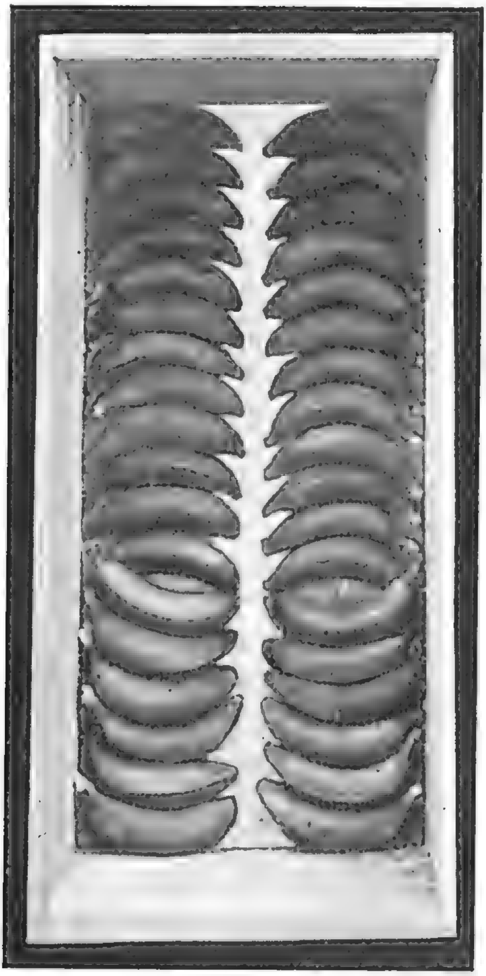


PLATE 208.
SINGLE ALTERNATE LAYER PACK.—Compare the completed first layer with the incomplete second layer.

Vertical Two Pack.

When bunches of good even fruit are obtainable, one of the easiest and best packs to use is the vertical two. This pack is started in the same manner as the single pack, a layer of singles being placed on the bottom of the case. Suitable twos are then taken from the hands (see illustration of fruit suited for the purpose, Plates 209 and 210) and

PLATE 209.
SUITABLE TYPE OF TWO FOR THE VERTICAL TWO PACK.

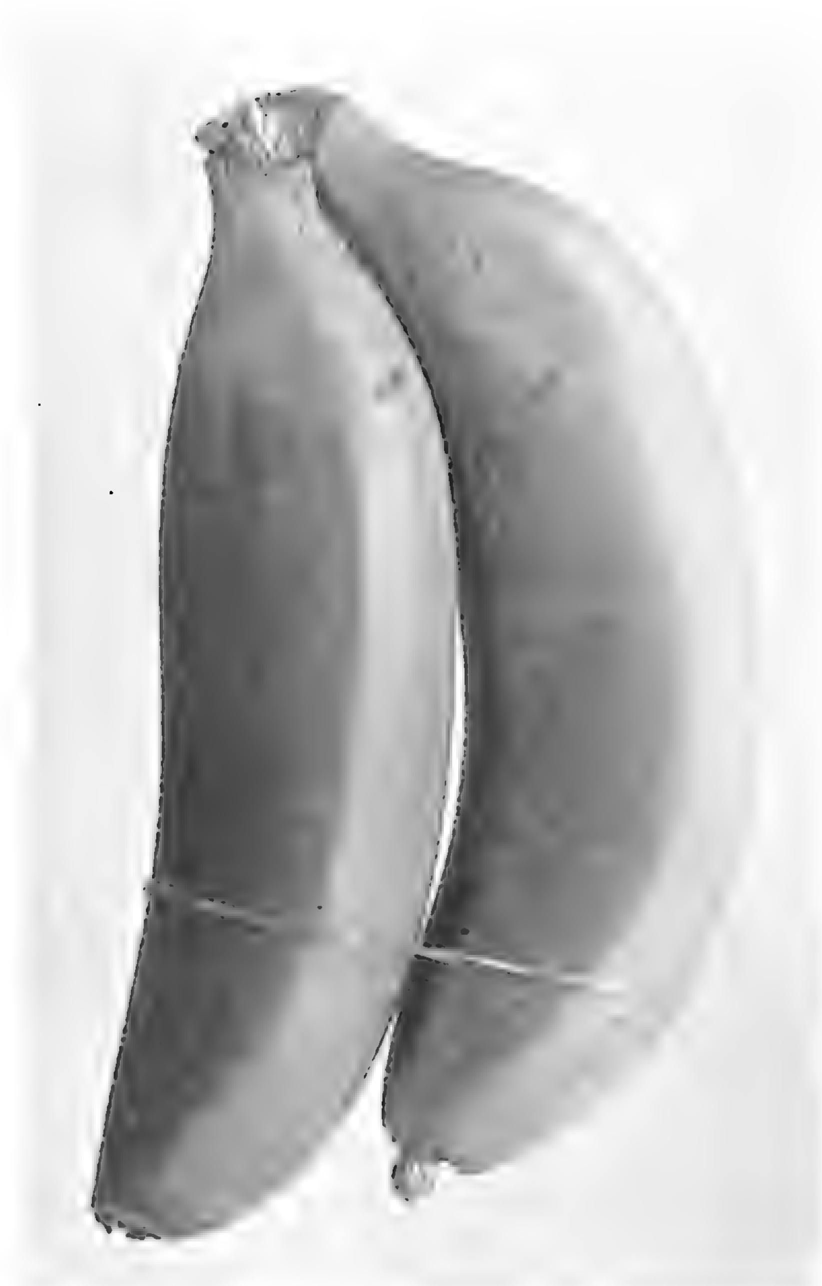


PLATE 210.
SHOWING HOW THE BANANAS ILLUSTRATED IN PLATE 208 PRESS TOGETHER IN THE VERTICAL TWO PACK.

placed in the spaces between the fruit of the bottom layer. The whole success of this pack depends upon the use of fruit, in twos, that will press firmly together without causing a pressure at the stalk end. The cases open at the side with the fruit showing in quite attractive straight lines (see Plate 211). Bananas in twos unsuited for this pack (Plates 212 and 213) can be placed on one side for use as key bananas or for placing in odd corners. Plate 214 shows the possible effect of using unsuitable types of twos.

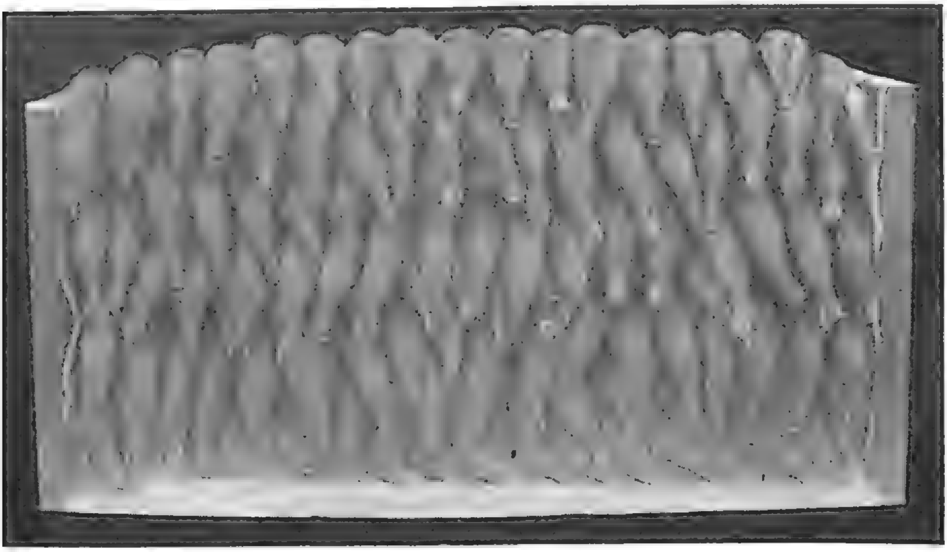


PLATE 211.
FINISHED CASE OF VERTICAL TWO PACK WITH SIDE REMOVED.

Part-Hand Pack.

Good even fruit is necessary for this pack and for the full-hand pack. The first layer consists of good even part-hands firmly placed in the case (Plate 215). Carefully selected clusters are then placed layer by layer upon this (Plate 216) until the case is finished (Plate 217). Any uneven clusters can be broken up and the fruit used to peg or fill any spaces created through the unevenness of the part-hands used.

The secret of success in all of these packs is care by the packer to complete one layer before starting the next. Plates 199 and 216 explain what is meant.

Full-Hand Pack.

This method of packing is not popular with agents, although it would assist in lessening many difficulties, such as Squirter and Black-end, encountered in transporting bananas. The main reason for its unpopularity is apparently that there is not so much fruit contained in the case as when singles are packed. Plate 218 shows a well-packed case of hands.

PLATE 212.
UNSUITABLE FRUIT FOR VERTICAL TWO PACK.

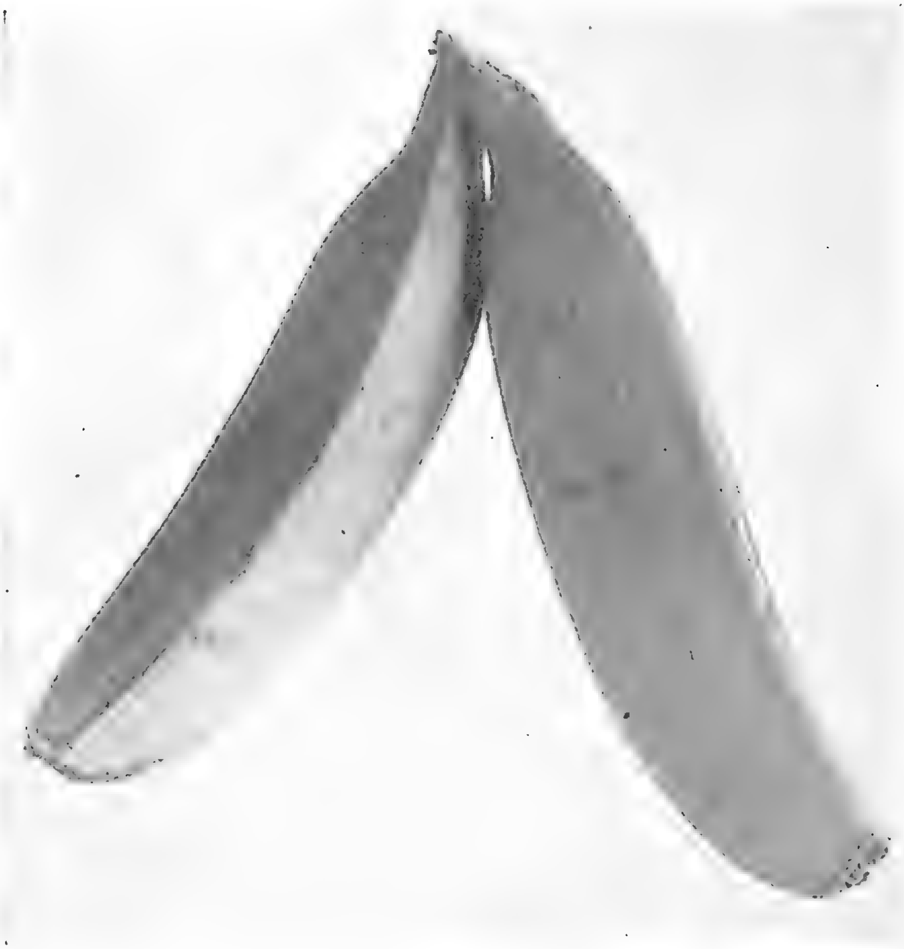


PLATE 213.
UNSUITABLE FRUIT FOR VERTICAL TWO PACK.

PLATE 214.

THE RESULT OF APPLICATION OF PRESSURE ON UNSUITABLE FRUIT.—This type of fruit should be used as key bananas or for packing as singles.

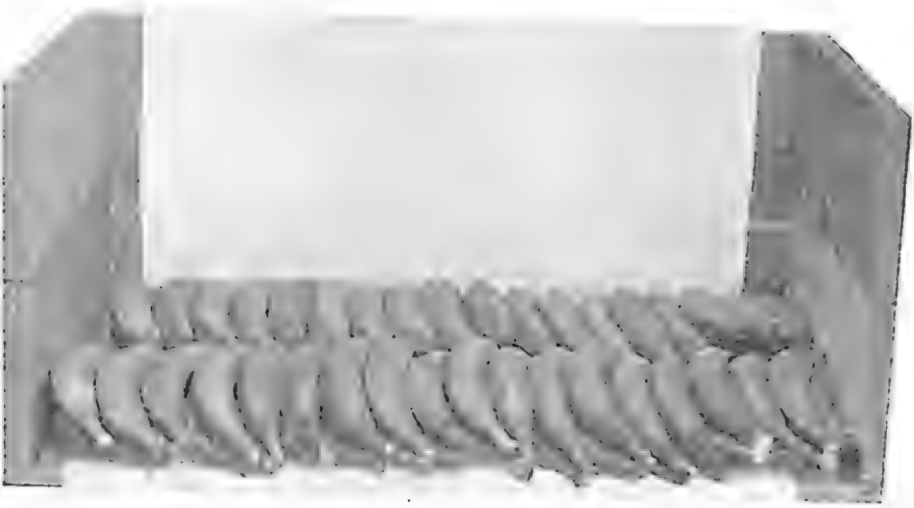


PLATE 215.
FIRST LAYER OF PART-HAND PACK.

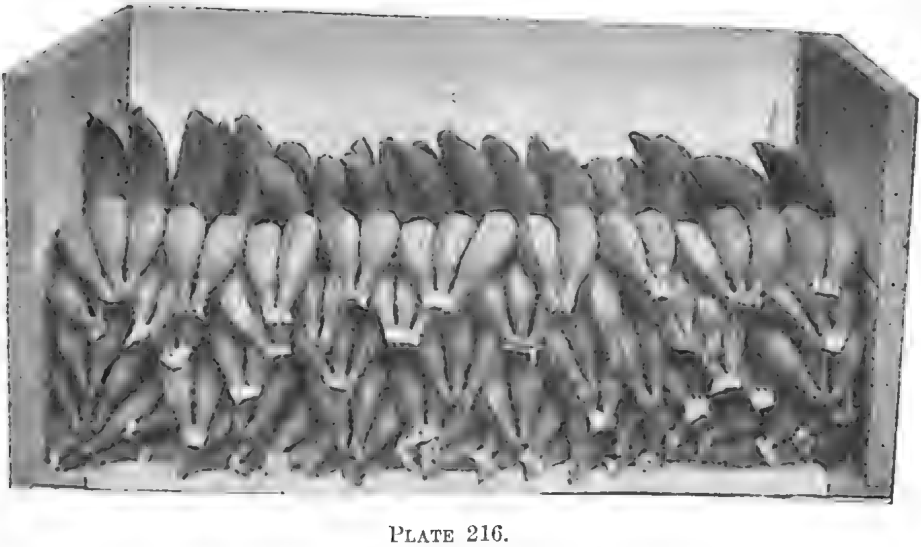


PLATE 216.
PARTLY COMPLETED PACK OF PART-HANDS.—Note that each layer is complete.

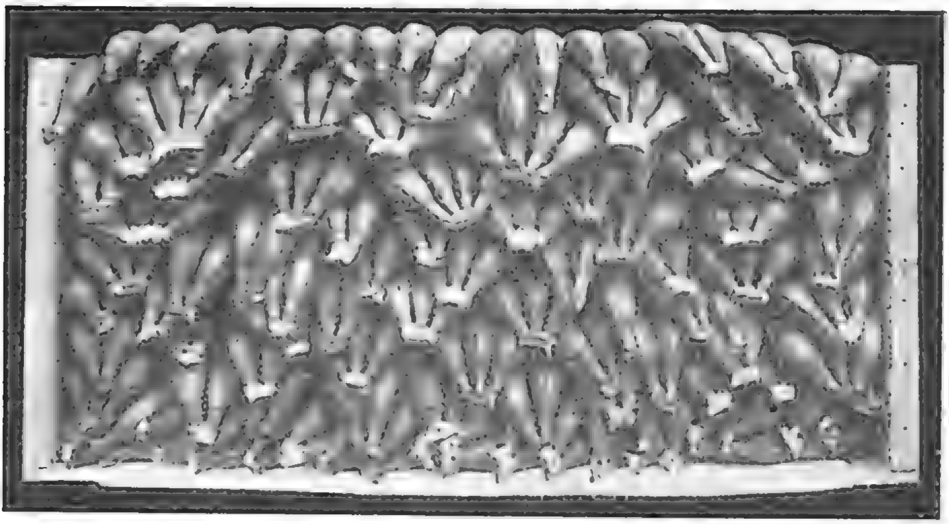


PLATE 217.
COMPLETE PART-HAND PACK OPENED AT SIDE.

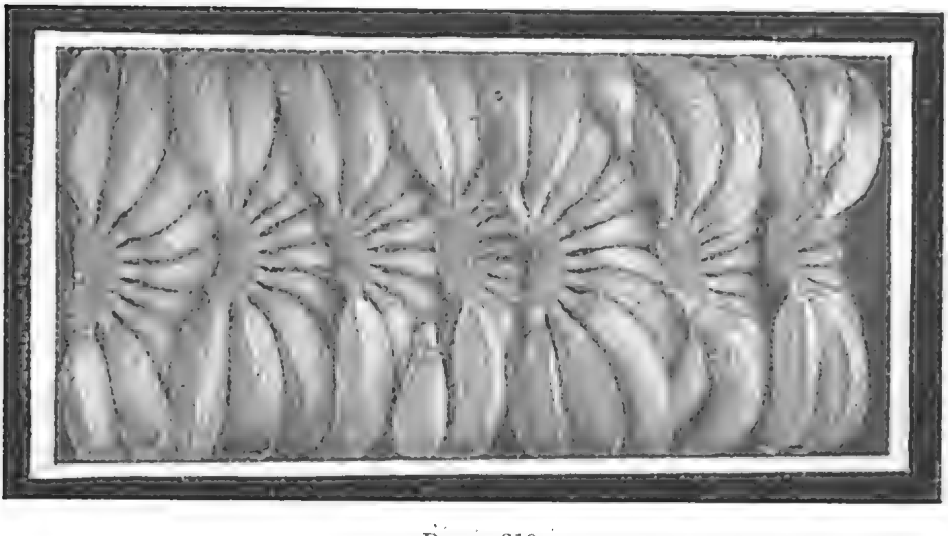


PLATE 218.
A COMPLETE CASE OF FULL HANDS BEFORE PLACING THE LID IN POSITION.

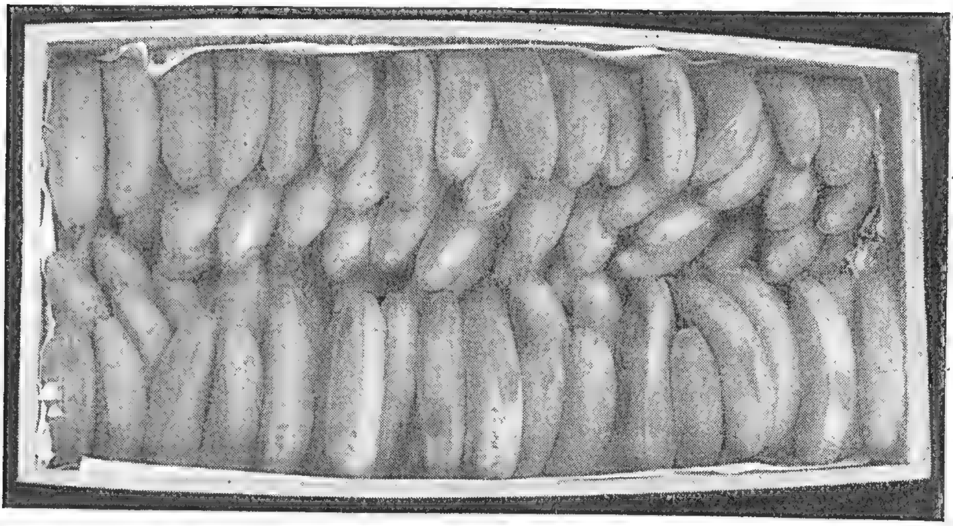


PLATE 219.

FULL-HAND PACK WITH SIDE REMOVED.—The poor appearance of the packed fruit is possibly the chief reason for the unpopularity of full-hand packing so far as the Agents are concerned.

The method of packing is to nail one board along the centre of the bottom of the case and place the first layer in the case as firmly as possible. The second layer is placed upon this (the flower end of the fruit in both layers being placed to the centre of the box), and all spaces filled or "pegged" with single bananas. The top is then nailed on and the case turned over, the bottom layer being filled in with singles in the same manner as the top layer. It is not satisfactory to endeavour to peg the first layer from the inside of the case. Plate 219 shows a case opened at the side, at the same time illustrating one reason why hand-packing is not popular with the merchants; the pack is not so attractive from the side of the case as it is when viewed from the top or bottom.

[TO BE CONTINUED.]

THE AVOCADO.

By H. BARNES, Director of Fruit Culture.*

THE Avocado, in a horticultural sense, is a comparatively new fruit in this State. In other parts of the world, because of its nutritious qualities, it has been described as "The Fruit Sensation of Modern Agriculture." It is at times miscalled "Avocado Pear," but the term "pear" is misleading in so far that the fruit resembles a pear only in the shape of some varieties. Generally speaking, the native home of the Avocado is tropical America, and in parts of that region it takes the place of meat in the dietary of the people. The Avocado is related botanically to the Laurel family, and two distinct species are generally recognised, which for practical purposes may be known as the Guatemalan and the Mexican species. It is easy to distinguish varieties

* In a broadcast talk from Radio Stations 4QG, Brisbane, and 4RK, Rockhampton.

of these species. The Guatemalan is considered the hardier grower, whilst the fruit possesses a thick skin which renders it less susceptible to attack by fruit fly. These advantages make the Guatemalan species attractive under Queensland conditions, and as a consequence orchardists should give it preference. Mexican Avocados possess a thin membraneous skin, and the leaves of the trees—which are usually smaller than those of the Guatemalan varieties—when crushed have a strong aromatic odour resembling that of aniseed.

PLATE 220.
An Eight-year-old Grafted Avocado.

Under average coastal conditions Avocado trees are pretty evergreens. They attain a height of up to 30 feet. The fruits of some varieties are pear-shaped, whilst others are quite round and about the size of an orange. The fleshy edible portion inside the skin is up to

1 inch in thickness and surrounds a single large seed. The flesh when ripe is of the consistency and colour of butter and possesses a peculiarly rich nutty flavour. It contains an average of 20 per cent. of fat, and is probably the highest of all fruits in nutritive value. It may be eaten fresh or as a salad with the addition of condiments such as salt, pepper, or vinegar. Usually the Avocado demands an acquired taste, as owing to its rich fat content it is at first trial disagreeable to many palates. As a matter of fact, the only fruit comparable with the Avocado is the Olive, and, similarly to the Olive, most people are prepared to admit that, once a taste is acquired, the flavour of the Avocado is delicious. The fruit is now largely grown in the United States of America, where there is an enormous demand for it. American horticulturists stated a few years ago that it was one of the greatest undeveloped sources of food which the Tropics have to offer. Since a study of the analysis of the fruit proved this statement to be true, its cultivation in Queensland can quite safely be undertaken with the assurance that the venture will be financially successful. There are several young orchards of Avocados in this State, and the growers have no difficulty in disposing of their crops, in some instances for 1s. to 1s. 6d. per fruit. Of course with increased production it cannot be expected nor is it desirable that the price remain so high. Nevertheless until production becomes excessive, returns will be quite profitable.

The Avocado is easily grown from seed, but as seedlings cannot be relied upon to come true to type, budding and grafting are resorted to. When being planted the seed should be covered with an inch or two of soil and kept moist. The time occupied in germination varies considerably; shoots sometimes appear in two or three weeks, but in other instances they may take two or three months. Generally speaking, however, about a month is the average time in warm weather. The seedlings grow very rapidly, and when they are from five-sixteenths to three-eighths of an inch in diameter they may be budded by the ordinary "T" method. The best time for budding is in the spring, twelve months after planting. The stocks will then be in vigorous growth and the operation will be easy to perform. Budwood should be selected from terminals just prior to the spring whilst the stock trees are still dormant, and the budsticks stored in damp sand until they are required. The grafted plants will be ready for transplanting to the orchard during the following winter.

When selecting the site for an Avocado orchard, preference should be given to a level site, or if such is not available, then to one with an easy gentle slope to the north-east, and well protected from strong winds. Although the trees are mostly evergreen, some varieties are inclined to throw their foliage at flowering time and make new leaves immediately. However, once they are established light frosts will not injure them, though heavy frosts tend to do damage. The land should be thoroughly ploughed and broken up prior to planting in order that the young trees may quickly establish themselves. If planted on the square system the trees may be set 25 feet apart, which will permit of seventy being planted to an acre. Planting closer than 25 feet is not advisable, as the trees are vigorous growers and occupy a lot of room in a few years after planting. Budded or grafted trees bear in the third or fourth year, and seedlings usually in the fifth or sixth year.

Many varieties of Avocados have been introduced into Queensland during the past twelve years, chiefly by the Queensland Acclimatisation Society, whose gardens are situated at Lawnton. The Department of Agriculture has also introduced a number. These have been tried out in trial orchards and the best selected, while those which were found to be unsuitable to our conditions were discarded. Intending planters would do well to concentrate on the proved varieties. It has been

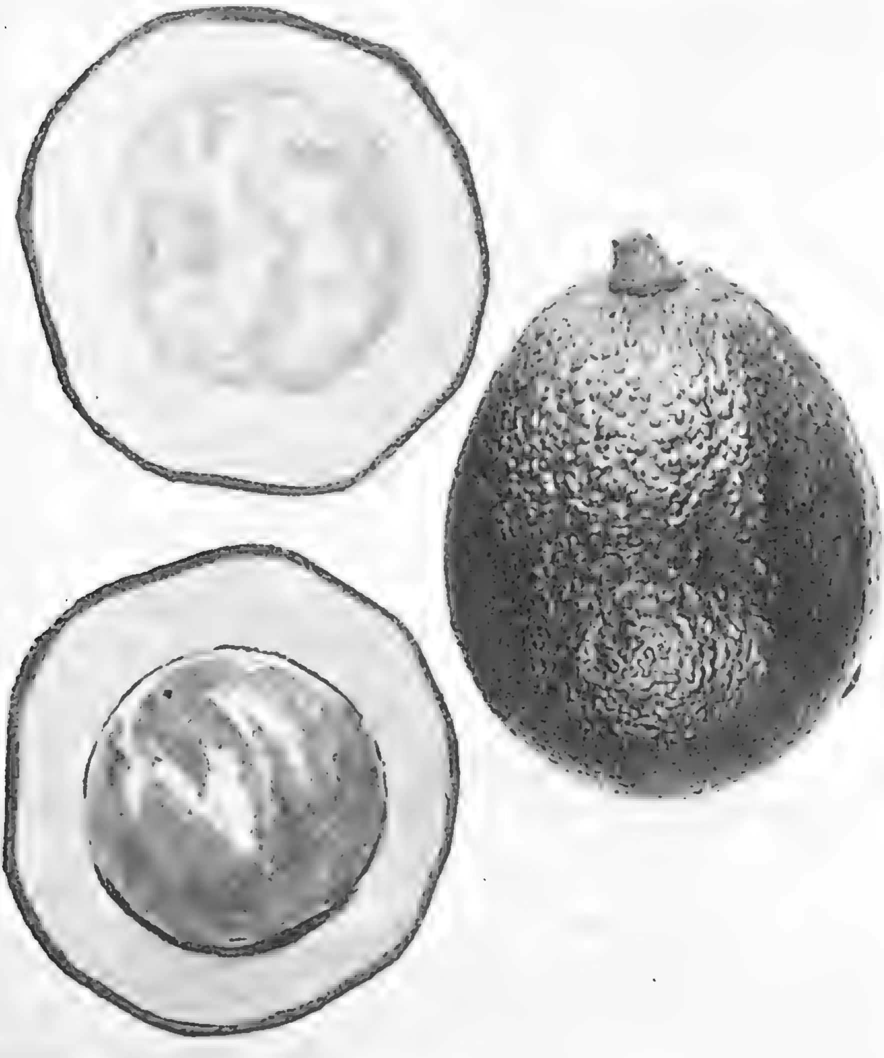


PLATE 221.
Avocado Fruit, and Fruit Cut transversely showing Seed in Lower Section.

found, for instance, that some varieties thrive for a few years and then commence to die back; others persist in producing extremely heavy crops of fruit at an early age and decay prematurely as a result; whilst still others are subject to affections known as sun-blotch and transmit this susceptibility to seedlings. Further, as has been previously stated, thin-skinned varieties are subject to fruit-fly infestation. It is essential, therefore, to obtain only those which have been

proved to be suitable varieties. The following varieties, which are all growing at the Queensland Acclimatisation Society's Gardens, are recommended:—"Fuerte Hybrid," "Blakeman," "Grande," "Goodwood," "Justice," "Pankey," and "Spinke," whilst a variety known as "Robinson" has proved itself exceptionally good and is the largest fruiting.

A good loamy soil is best for growing Avocados. The main essential is that the soil is well-drained, since stagnant water at the roots is fatal to the tree. Soils similar to those on the Blackall Range and Tamborine Mountain have proved themselves to be particularly suitable, and the rate of growth of the trees at both these places is remarkable. One tree seen recently on the South Coast made the phenomenal growth of 9 feet in a year, whilst a five-year-old seedling tree on Tamborine Mountain is over 20 feet high and has just carried a heavy crop of fruit.

SOME TROPICAL FRUITS.

3. THE VI APPLE OR HOG PLUM.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

A RELATIVE of the fruit discussed last month (the Cashew) the Vi apple is totally different in appearance both of tree and fruit. The tree is symmetrical in habit of growth, the branches radiating from a straight, smooth-barked trunk. The foliage is clustered towards the ends of the stiff branchlets and is composed of compound leaves, the leaflets being numerous. The tree is semi-deciduous.

The fruit is borne in clusters, on stalks up to about 3 inches long. It is oval to obovate in shape, 2 to 3 inches long, yellow in colour, and russetted. The skin is thin and the yellow flesh is somewhat of the consistency of a scarcely ripened pear. The seed is covered with woody fibres which extend into and cling to the flesh. The flavour is distinctive and sub-acid, and when acquired is quite pleasing in so far as good varieties are concerned. Like most tropical fruits, however, it has been largely propagated from seed, consequently many trees met with are very inferior, and a taste of the fruit from one of these inferior trees would prejudice a person against them for all time.

The fruit is used principally as a dessert or for jam and jelly making. The jelly made therefrom is of good flavour, colour, and consistency.

This fruit is a native of Polynesia and has now become fairly widely distributed in tropical countries. It requires a tropical climate and thrives best on deep, rich, scrub lands. It will grow fairly well, however, on comparatively poor soils, but does not attain to the same size or prolificness reached under more suitable conditions.

In North Queensland the tree is represented by a limited number of specimens, mostly growing in the Cardwell and Murray River districts. In these areas the trees crop well, ripening their fruit between May and July.

As regards pests, only two have been noticed to cause much loss. The fruit fly frequently infests a good many of the early ripened fruit, but the cooler weather steadies their attack during the later part of the

season. Flying foxes decimate the crop rapidly as soon as they discover the ripe fruit. One or two of these trees should make a good decoy for foxes. The foliage is usually sparse when the fruit is ripening, consequently the foxes can be easily located and shot.

This fruit tree appears to bear a different name in each country in which it is grown. Whilst "Vi Apple" and "Hog Plum" are the names commonly used in Queensland, it is known in Ceylon as "Ambarella," in Jamaica as "Jew Plumb," and in some other countries as "Otaheite Apple." This last name is also frequently applied to another fruit, the Malay Apple (*Eugenia malaccensis*). The botanical name is *Spondias cytherea*. *Spondias dulcis* is a botanical synonym.

The tree is usually regarded elsewhere as being somewhat difficult to raise from seed, and propagation by budding or grafting on the mango is sometimes resorted to. In North Queensland this does not seem to be the case, the writer having observed a number of seedlings raised without any particular attention. Vegetative propagation is desirable, however, when it is desired to perpetuate or multiply a particularly good tree.

THE FRUIT GROWING INDUSTRY IN THE NORTH.

The Director of Fruit Culture (Mr. H. Barnes) has received the following reports on their respective districts for the three months ended 30th September, 1935, from the Instructors in Fruit Culture at Cairns and Bowen.

Cairns District.

WEATHER during the quarter has been very dry. Earlier in the period some cold periods were experienced, and the heaviest frost for some years was recorded in the Herberton area. The rainfall at Cairns was 334 points on twenty wet days, as against 401 points on twenty-eight wet days for the same period of 1934.

Gathering of the main citrus crop has been completed in the chief citrus districts—Cardwell and Murray River. Several wet days in July hastened the maturing of oranges, and resulted in the falling of several thousand cases of fruit. Throughout the North trees carried a light second crop, which is now maturing and which in the Cairns District is already being harvested.

Prospects for the pineapple crop in the Cairns district appear to be fairly good; although, owing to degeneration of the plants, lack of cultural attention, and sometimes to unsuitable soils, the likelihood of much good-sized fruit is remote.

Bananas have been very scarce throughout the Northern Division and have not been of the best quality. Plantations on the Atherton Tableland were severely frosted at the end of July, and production from that area will not be renewed for some months. During the dry weather in the latter part of the quarter, many plantations of sugar bananas around Cairns suffered considerable damage from Panama disease.

Mangoes have blossomed heavily; the coincidence of fine weather with the blossoming period resulted in a good setting of fruit.

Papaws have been in fairly short supply, but recently good crops approaching maturity have been noticed in the orchards.

Granadillas ripened a crop of good fruit which found a ready sale.

Litchi trees in the Cairns and Mossman districts show promise of a good crop of fruit during the coming season.

Various other tropical fruits have blossomed during the quarter and are carrying fair crops.

Tomatoes in the Cardwell district are healthy and show good promise. The crop is now being gathered and shipped to southern markets. Good crops were produced during the quarter in the Cairns district and were disposed of on the local market. The crop is now practically finished.

Bowen District.

Weather conditions throughout the quarter have been dry in the Bowen district and up to Townsville. Five wet days were recorded at the Bowen Post Office for 107 points of rain. Only 14.62 inches of rain have been recorded since the 1st January, 1935. Somewhat heavier falls of rain have occurred in some localities, but the season can be classed as exceptionally dry. This continued dry weather has had a very retarding effect on tomatoes, cucumbers, and fruits generally. Early areas of tomatoes went off quickly, and the later plantings have produced only with the aid of irrigation.

With regard to tomatoes, somewhat of a transitional policy has been adopted during this season in that new varieties have been tried to replace the old "Buckeye" types which had to be discarded on account of their liability to black spot. "Mahona" or "Marhio," "Break o' Day," and some "Pritchard," were grown. The globe types have been retained and generally did well, although tending to run small. "Mahona" and "Break o' Day" produced a lot of "catface" fruit. By careful selection of fruit from these varieties an improvement may be brought about in the direction of obtaining a good blemish-free fruit. The quantity of tomatoes exported for the quarter is less than last season.

The area under pineapples can be said to be remaining stationary. This crop has also been affected by the continued dry weather, and good early rains are necessary to start the plants off well for the summer crops. The small consignments which have been forwarded during the quarter have been of good quality.

Mango trees generally are setting fruit nicely, and with favourable weather conditions good returns will result. An increase in the number of good class trees coming into bearing is noted.

Cucumbers have not generally been up to the standard, and even this measure of success has only been obtained by continual watering.

Small lots of egg fruit, chillies and capsicums, and rock melons, have been sent to the South during the quarter. All were of good quality.

Banana plants at Bowen and north to Townsville are being kept alive and producing only by continual watering. North of Mackay they have been a little more fortunate in the rainfall, and areas look better.

MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

THE difficult season so far as marketing is concerned is now rapidly approaching. The last of the old season's fruits—apples, citrus, and strawberries—will have their kingdom assailed by the new season's stone and pome fruits, with mangoes reappearing on the market after a long absence.

Apples.

Many lines of Sturmers, becoming harder to handle as the year goes by, are now going "sleepy" as a result of over-storing. It is hard to understand why people keep this variety in storage after the beginning of September. Granny Smith, Democrat, and Yates are now the only good varieties available. Prices have remained firm, up to 13s. per case being received for good fruit.

Citrus.

Orange supplies have been maintained, with a good demand for good-sized lines. Small fruit is still a problem. A long-sighted policy of pure fruit-juice extraction and sale could still be of benefit in relieving the market of over-supplies of small fruit. Good lines of Valencias are realising from 6s. up to 9s. per case.

With mandarins, quality fruit is hard to get, so prices would not be a good indication of actual values. Brisbane prices ranged from 6s. to 12s., with a few specials higher.

Uncured lemons are not popular. It is sound advice to pick and cure lemons when the fruit is just changing colour. Previous months' prices have been maintained, viz., 6s. to 10s. per case on the Brisbane market.

Grape fruit rates have been maintained, Marsh Seedless realising the best prices.

Passion Fruit.

Good passions have sold exceptionally well, up to 16s. per case being obtained. With increasing supplies prices will ease. With this fruit it is advisable when packing to separate smooth-skinned fruit from "crinkly" fruit, as this will enhance the value of the whole line.

Papaws.

With warmer weather approaching, the market has improved for good lines of papaws. Brisbane senders would do well to leave the fruit on the trees a little longer, as green fruit has not been ripening up satisfactorily. Up to 5s. has been obtained for good lines in bushel cases. With the advent of the warm weather trouble from fungal spotting should be much less in evidence.

Mangoes.

Growers sending South should concentrate on supplying only the best types of fibreless fruit to the Melbourne and Sydney markets. Wrapping the fruit and layering it with woodwool is of great assistance in promoting better transport, as placing the fruit in cases without using packing greatly increases the amount of bruising and waste. Half-bushel cases are preferable to bushel cases, as they give greater

protection to the fruit. Only the best types and varieties are worth planting commercially. Prices in Brisbane for early fruit have been from 8s. to 10s.

Bananas.

No great change has taken place in banana prices during the last month. Growers sending South should now take more care in cutting. Owing to the warmer weather, fruit showing a tendency to ripeness should be marketed locally.

Pineapples.

A similar warning as a result of the approach of warm weather is given to pineapple growers—over-maturity of fruit is to be avoided. During the last month prices have been maintained. When sending fruit to the Southern States the use of woodwool for packing is recommended. Prices in the Southern markets have firmed.

General.

As soon as supplies are available in Australia, experiments with various types of chemical fruit wraps are contemplated in an endeavour to ascertain whether any definite control of the spotting in transit of tropical fruits can be obtained.

BANANA NOTES.

By J. H. MITCHELL, Agent, Banana Industry Protection Board, Yandina.

In submitting the following notes to the Director of Fruit Culture (Mr. H. Barnes), Mr. Mitchell points out that there is nothing really new in them, but in the course of his inspectional duties he has found a lack of knowledge even among old growers regarding the factors governing successful banana growing. And in the case of inexperienced growers they may desire to know whether the suckers or "bits" are good, bad, or indifferent, and whether they are planted correctly or incorrectly.

FACTORS which have an important influence in the production of quality fruit and general welfare of plantations are—Preparation of soil; digging holes for planting; correct types of bits and suckers; and method of planting.

These essential tasks are very often not given the amount of attention to which their value entitles them, consequently, although strict attention is paid later to cultural and desuckering methods, the ultimate result is unsatisfactory.

Preparation of Soil.

Plantations located on forest country composed generally of soil that has become more or less hard on the surface through exposure to the elements and usually carrying heavy timber and crops of undergrowth, mostly blady grass, demand, for best results, that the soil be broken up before planting.

The preparation of a reasonable depth of soft friable soil for the roots of the plant to travel and vegetate in, is a basic principle of horticulture, and the banana being recognised as a gross feeder demands

the maximum amount of cultivated soil within reason. Given inducement, banana roots will not only travel great distances just below the surface, but will penetrate into the lower or subsoil, thus ensuring stability and greater resistance to adverse conditions.

As on banana hillsides ploughing is rarely possible, the soil should be grubbed or picked to a minimum depth of 6 inches and left in as rough a condition as possible, allowing access to air and sunshine. When finally broken up into a fine tilth through the action of the elements, its physical features will have altered materially with beneficial results to the crop, and if fertilizing is resorted to, results will be more satisfactory still. The selection of tools for breaking up the land is governed by the class of country—e.g., in very stony country, which, incidentally, experience has shown to be best adapted to banana growing, a pick is the most suitable tool and in plainer tracts, a single blade three-pronged grubbing tool answers the purpose.

Digging Holes for Planting.

In numerous instances through lack of time or capital, the planter after burning off, decides to plant up and do the breaking up at a later date. This practice is quite in order provided the planter prepares sufficient root room for the growing plant before planting, to minimise the risk of injuring tender roots during breaking-up operations, which should then be commenced as soon as possible after planting is completed.

To prepare a site for a banana plant the soil should be removed from a space at least 2 feet in diameter to a depth of approximately 10 to 12 inches. The walls of the hole should be as straight as possible and towards the bottom should be disturbed as far back as the digging tool will allow. A mattock, or as it is commonly called, a grubber, with a digging blade made about 12 inches long by 2½ inches wide answers the purpose for hole sinking generally, but in particular instances, a pick or bar is necessary.

The frequent practice of preparing a hole for the reception of the plant, approximately 15 inches in diameter at the top, tapering down to a mere nothing at the bottom, into which the sucker is figuratively rammed, is a very bad procedure, as it tends to stunt the plant from the start and definitely forces it to come to the surface. Growers and intending growers cannot be too strongly urged to give this, one of the most important stages of banana culture, the correct treatment.

Grade Standard of Bits and Suckers.

The selection of young plants to lay down the prepared plantation is important. If the grower intends to use plants from his own area or to secure them elsewhere, he should have a knowledge of what is required to produce strong virile plants, capable of producing fruit that will "make the grade," and should allow none but these to be planted in his plantation.

Diseased plants are prohibited because of supervision by inspectors and the vigilance of the planters, but it is certain that quantities of inferior low grade plants are dug and replanted every banana season, to the detriment of the industry as a whole and certain unfortunate growers in particular. This condition of affairs could be overcome to a marked degree if the buyer, seller, and user of banana plants had a

fair knowledge of what constitutes a standard bit or sucker. The following grade standards for banana plants were issued in a regulation in the "Government Gazette" of 16th June, 1934:—

(1) *Suckers.*—A sucker is the off-shoot from the corm of a mature plant, from a planting not less than twelve months old, provided that the corm of such sucker shall be not less than 3 inches in any diameter below the point of commencement of development of the pseudostem.

(2) *Bits.*—A bit is a portion of a mature corm of a banana plant, provided that such bit shall consist of a well developed undamaged "eye" protruding not less than ½ inch above the surface of the corm to which it is attached, the eye to be not less than 1½ inches from any edge, width of surface to be at least 4 inches, and depth behind eye at least 3 inches.

Method of Planting.

A fixed rule for nature cannot be laid down, especially in the case of bananas, as the topography of sites, especially in parts of Queensland, ranges from minature quarries to plain grassy swards, but a fair working basis is suggested amenable to circumstances.

If planted too deeply, the formation of a secondary corm above the original is often the result and as this takes time, it often throws the calculations of the planter astray. On the other hand, if planted too shallow, the corm has a tendency to rise above the ground level, causing loss of vigour through lost root action and a proneness to toppling over when carrying a bunch.

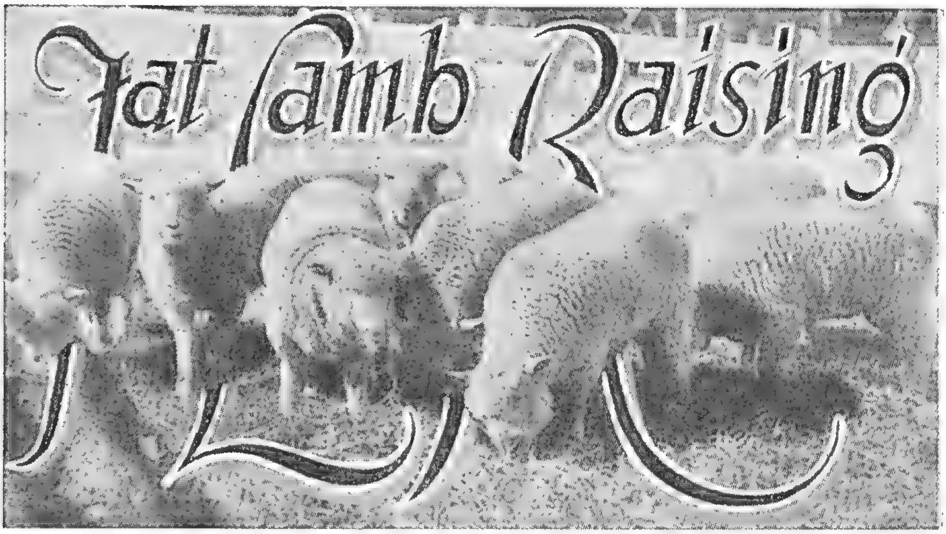
A fair working basis is to place the sucker in a hole, which, if filled level with the surrounding soil makes the unison of the corm and pseudostem approximately 6 inches below the surface. It should be noted that the side of the sucker furthest away from the parent plant usually produces the correct follower, and a sucker should be placed accordingly and covered in the initial stage with not more than 2 inches of soil, leaving the remaining 4 inches to be subsequently filled in by erosion and mechanical process as the plant develops.

A bit should be planted differently to a sucker. In the case of a bit, the protruding eye should be planted facing *down* at the same depth as recommended for suckers, and receive the same treatment in its initial and subsequent stages.

A USEFUL TANK STAND.

A suitable stand for a tank can be made by filling a ring of corrugated iron with sand. The ring should, of course, be well riveted, and it is also desirable to strengthen it further by means of hoops of fencing wire twitched up hard against the iron.

The greatest pressure on the floor of the tank will be about its centre, and it is advisable, therefore, to give the sand filling a slight crown at the centre so that the tank, when full, will settle with a level floor. The life of the floor of the tank, and also of the ring of galvanised iron, will be greatly extended if the surfaces coming in contact with the sand are given a wash of cement.



SHEARING AND SHEARERS.

With reference to the article which appeared under this heading in the September (1935) number of the "Queensland Agricultural Journal," Mr. T. J. Peard, Manager of the Wolseley Department of Buzacotts (Australia) Limited, writes:—

BEING the premier wool producing country of the world it is really appropriate that machinery for shearing sheep was invented by an Australian, and first came into general use in Australia.

The inventor, Frederick Yorke Wolseley, the son of a clergyman, was born at Kingstown, in the county of Dublin, and was a member of the same family of the late Lord Wolseley, whose name figures so memorably in the annals of recent British history.

He arrived in Australia in 1854 and spent the greater part of his life on stations on the Murray, in Echuca and Deniliquin districts. Most of his experience was gainted through the association and guidance of John Phillips, which lasted until 1859 when the latter established the firm of Phillips and Company, and bought back for £70,000 the property known as Warbreccan, near Deniliquin. This property had been previously sold for £18,000 to the pastoral firm of Phillips and Graves, of which John Phillips was a partner. Mr. Phillips had been managing Thule, Cobran, and Tenteran stations, from which he resigned on the repurchase of Warbreccan. Mr. Wolseley was then appointed manager of the properties named, and it was during his term in this position that he first conceived the idea of shearing sheep by mechanical means.

Some time later Mr. Wolseley returned to the home of his birth and did not come back to Australia until 1874, when he again became interested in the pastoral industry, spending much time and money on the invention on which he was still working.

In 1876 he purchased Euroka Station, near Walgett, where he continued his experiments, with a view to perfecting his patent, and in 1886 he considered it sufficiently satisfactory for practical use. In 1877 the patent was granted him for his original rope-driven machine.

After very careful study and trial he adopted the friction drive machine and demonstrated this important improvement before a group of citizens in Goldsborough Mort Wool Stores in Circular Quay, Sydney, in 1887.

PLATE 222.

WOLSELEY SHEEP-SHEARING MACHINE DEMONSTRATION.

The demonstration was made before a group of citizens in Goldsborough Mort Wool Sales, Circular Quay, Sydney, in 1887. The inventor, Frederick Yorke Wolseley, is standing second from the left, resting on a walking-stick.

Although the machinery of to-day is as nearly perfect as mechanical ingenuity can make it (ball bearings having replaced the old type metal, and other vast improvements incorporated as the years rolled on), the same principle of friction drive evolved by Wolseley during the 'eighties of last century is incorporated in all standard machinery of to-day.

Mr. Carew's reference to shearers' tallies as published are interesting and to which may be added the following:—In 1922 at Mahrigong, Corfield, E. R. Vernon broke the North Queensland shearing record by shearing 305 sheep in 7 hours 48 minutes, which compares more than favourably with Howe's record of 336 in 9½ hours, especially considering the advantages in favour of the latter. Vernon and nine other shearers averaged 245 for the day.

TO UNREEL BARBED WIRE.

Run an iron rod through the roll of wire and over each end of the rod slip a small jam tin with a hole in the centre of the bottom. Then loop a trace chain over the end of the rod at each side and attach a swingle-bar to the middle of the chain. The free end of the wire is fastened to a post and a horse hooked to the swingle-bar on the wire and the roll pulled along. The wire not only comes out straight, but most of the slack is taken up and there is very little straining to do.

Development of the Shearing Machine.

IN a recent issue of the *American Sheep Breeder* is an article entitled "Shearing Through the Ages," from the pen of E. S. Bartlett, a noted exponent of the art.

We don't know, Mr. Bartlett remarks, just how long ago it was that man domesticated the sheep, but historians say it was, without doubt, in the neighbourhood of 10,000 years B.C. It is known, however, that by the time of David, as recorded in 1st Samuel, sheep were run in rather large flocks and that shearing time was an important event marked by a general gathering together of the sheep and by feasting. The herders came to the shearing place with their bands; shearers, no doubt, noted for their skill, were on hand, and the harvest festival of the sheepmen was celebrated.

This brings us to about 3,000 years ago, the starting point for this history of sheep shearing. It is quite likely that at about this time in history sheep shearing began. During the centuries between the time that man first became a shepherd and the time of David, it is probable that the wool of the sheep was pulled, either from the live animal or from the skin after slaughtering.

Shears from Damascus.

Our reason for assuming that the shearing of sheep began about 3,000 years ago is that it was then Damascus had become famous for the products of its looms as well as for its wonderful steel blades. What is more reasonable to suppose than that the raw material for fine woollen fabrics produced in Damascus came from the flocks in the country around Mount Carmel, and that the Damascus workers in metals supplied the shears with which these sheep were shorn? At the present time in Palestine there is offered for sale to tourists supposedly antique sheep shears. Those shears [familiar to many members of the Australian Light Horse who were on active service in Palestine during the great war—Ed.] have narrow blades about 8 inches long and curiously-formed handles. They are no doubt close copies of the shears used hundreds of years ago.

In more recent times, the writer continues, when sheep raising had become well founded in England and the modern breeds were being established, that country had also developed a cutlery industry that was sending its products all over the world. Hand shears are an important item in the list of edged tools that has made English cutlery famous, so we can feel sure that the shearers of Old England were well equipped for their work.

If the sheep shears now offered to tourists in Palestine are accurate copies of antiques, there has been a change since early times in the way in which the two blades are joined. Present-day hand sheep shears have the two blades connected by a single or double bow spring at the base of the handle. The blades do not cross one another as in the regular every-day shears or scissors. The antique sheep shears had the two blades joined by a pin, which allowed one blade to cut by the other exactly as ordinary household shears do. On examing a pair of sheep shears one is impressed with the design. The manner of joining the blades and the curve of the cutting edges makes the blades come together from base to point with an almost uniform cutting angle.

For hundreds of years sheep were shorn with hand shears, but with the mechanical developments that began early in the nineteenth century, some inventors turned their attention to sheep shears that could be operated by power.

First Mechanical Shearer.

At the time Elias Howe was developing the sewing machine in a little New Hampshire village another New England Yankee was working with some success, and in the same town, on a sheep-shearing machine. The work this man did attracted the attention of an Englishman by the name of Wolseley, who was working along the same lines in Australia. It was known that Wolseley came to America to study what was being done by our Yankee inventors, and claims are made that the information he secured had much to do with his success later in making a practical shearing machine.

In connection with the development of the shearing machine, it is interesting to note the truth of the old adage, "Necessity is the mother of invention." In a very few years after the introduction of sheep into Australia their numbers became so great that the problem of shearing them with the labour available had to be solved.

Wolseley saw the need of mechanically-operated shears that would shear closer to the skin than was possible with hand shears, and that would allow a smaller number of shearers to remove the wool from the vast number of sheep found in Australia at that time. He worked persistently between 1860 and 1870, and succeeded in producing a satisfactory sheep-shearing machine.

When the shearing-machine is compared with some of our present-day intricate mechanical devices, it may seem to be an extremely simple contrivance. On the other hand, when we stop to consider that the means of transmitting power to the handpiece through a flexible shaft, the design of the comb and cutter, and the means of applying tension to the cutter, worked out by Wolseley, are with slight modifications still in use, we are impressed with the really great things he accomplished.

It is to be regretted that there is no record of the manner in which Wolseley worked out the different problems that confronted him. It would be very interesting to know the steps taken in developing the comb and cutter, as well as how the correct tool for sharpening them was devised.

But to go back to where we left off with the shearing machine coming into general use in Australia. The development of the shearing machine did not revolutionise sheep-shearing methods. The shearing machine had no such far-reaching effect on the wool-raising industry as the invention of the grain binder, which was developed at about the same time, had on the production of wheat. Each sheep must be handled and shorn individually with the machine, the same as it is when hand shears are used, and the size and shape of a sheep's body limits the width of the swath that can be cut with the machine.

The shearing machine, however, because it cuts closer to the skin than can be done with hand shears, has added millions of pounds of wool to the world's supply since it came into general use. It has also made possible the shearing of the sheep in the thinly-populated countries where sheep are run in great numbers by a much smaller number of shearers than would have been required if it had not been invented.

So long as sheep were raised only in small flocks on the farms in the Eastern United States the need of shearing machines was not so great as in a country like Australia. As soon, however, as the flocks in the range country increased in numbers the same conditions that made the shearing machine necessary in Australia developed in America, and the Wolseley machines, which were being manufactured in England, were brought to that country.

SCIENCE IN FARMING—SUGGESTIONS FOR HOME STUDY.

A VERY useful set of notes on the scientific principles involved in horticulture and agriculture has been prepared by D. A. Herbert, D. Sc.—How do plants feed? What is the action of various manures? What is the cause and the nature of various plant diseases? Such questions as these are answered as well as many others which are of interest to the practical farmer.

Dr. Herbert's notes are obtainable from the Department of Tutorial Classes within the University of Queensland, corner of Edward and Ann streets, Brisbane. There are twenty-one papers, and they will be posted, one each week for twenty-one weeks, for the sum of 8s. 6d. For this sum farmers may buy the notes and borrow books on the subject as well. Several books on the subject are available, and may be changed from time to time during the twenty-one weeks period.

It is worth mentioning that the Department of Tutorial Classes has similar sets of notes or talks on a variety of subjects. A very wide range of subjects is embraced, and some of these might be of interest to farmers, their wives, or to members of their families. For example, there is a very useful series on food and diet. Human biology is another subject dealt with.

For those interested in social subjects there are series in world history, Australian economics, psychology, &c., on books and literature there are several series. For younger members of the family, who may want to develop their capacities for self expression, there are sets of notes on elocution and on composition and writing.

On all the foregoing subjects there are helpful text-books of information, and these may be borrowed and changed without additional cost.

Anyone at all interested would do well to write to the Director of Tutorial Classes, corner Edward and Ann streets, and ask for a leaflet of information.

A very useful lending library, from which books may be obtained either through the Post Office or Railway Department, is also available at the same address.

Some Australian Shearing Records.

IN 1924 a team of five shearers at Glenburgh, W.A., on the Gasgoyne, shore an average of 1,102 sheep per day for the team for a week of five days or a fraction over 220 sheep per man per day. The highest tally of 276 was cut by W. Gray on August 20th.

The same team at Dalgety Downs station during the same season shore 1,173 sheep in one day of eight hours or an average of 234 per man the highest individual tally being W. Gray's of 286.

The first notable shearer, and probably his tally stands to-day for blade shearing, was Jack Howe, who at Alice Downs in the Blackall district in Queensland shore 321 with the blades, and the same year or the year following he shore 276 with machines at Barcaldine Downs, thus winning Messrs. Coleman & Sons' two gold medals for the fastest machine shearer and blade shearer in Australia.

The next tally of importance and which is probably still one of the highest, if not the highest in Australia, was Dan Cooper's performance at Bundooran in Queensland, when he shore 316 sheep, no lambs, in eight hours ten minutes winning a gold medal from the Moffat Virtue Machinery Company in 1910.

Previous to 1909 the best tally with the machines was that of Jimmy Power, who shore 315 at Bareny. It is not known what the hours or the class of sheep were, however. Perhaps the fastest shearer who was ever in Queensland was Harry Livingstone, who was highly skilled with the machine, and had a perfect style, but his highest tally was never made public. At any rate we have never heard of a shed after he had learnt to shear that he was not able to ring.

One year at Gordon Downs I put a team of guns together in which Harry Livingstone was included, and I am perfectly safe in saying he cut from 10 to 20 sheep per day more than any other shearer in the shed. However, while at his zenith, he abandoned shearing, having been appointed representative of the Wolseley Shearing Machine Co., in Central Queensland.

It has often been reported, and it is authentic, that another blade shearer in Jack Howe's time was quite equal to the champion, but not in fast shearing sheep. It has frequently been said that Alf Bligh was Jack Howe's master in rough sheep with the (bright swords) shears.

Tom Shea was another good blade shearer. He was known as the handsome shearer. It was often commented on that he never worried whether he had a driver on his blades or not.

Another of Queensland's best shearers was the late Joe Herricks, who has been a champion for many years. He afterwards came to Western Australia, his highest tally in 1927 at Landor being 274, and I am inclined to think in that year he was the best man in Western Australia, in rough, heavily woolled sheep, despite his years.

A Western Australian writer puts forward the claim that there is as good a class of machine shearer in the west as they have in any other State. Of a particular record he says:—

"The sheep shorn averaged 11 lb. wool and therefore the following figures showing the daily tallies of the eight shearers for two weeks are interesting.

"Commencing on September 3rd, the team shore 1,509, 1,708, 1,577, 1,748, 1,698, 927 (Saturday, half day). Total for week, 9,167.

"Resuming on the second week the same team clipped 1,189 on September 10th, losing one hour through engine trouble, 1,432, 1,740, 2,800, 1,806, 803 (Saturday, half day). Total for week, 8,770.

"The highest individual tally was 250 and two men obtained this figure. The shearers' highest daily averages were:—A. Williams, 213; R. Sawallish, 242; Vol. Day, 242; F. Lehmann, 234; L. Saltmarsh, 216; George Bence, 222; C. Fleming, 226; and H. Munro, 205; total 1,800, and average 225.

Highest Tallies.

"Therefore it can be assumed that 321 is the highest tally with blades, in an 8½-hour day, shorn by Jack Howe at Alice Downs in Queensland in 1892, the highest tally with machines being 316, shorn by Dan Cooper at Bundooran in Queensland in 1910.

"At Three Rivers, in Western Australia, Harry Finlay shore 301 and Bob Sawallish at Dalgety Downs, W. A., shore 304, these tallies being cut in 1928.

"I claim to hold the record for a day's tally cut at any individual shed. At Brookong in the Riverina in 1902, where approximately 170,000 sheep were shorn on three occasions, the daily tally was over 10,000 sheep, the highest being 10,361."

ESTIMATING ANIMAL'S AGE.

It is usual to count all of the horn beyond the first groove or ring as representing three years' of age; then add one year to the age for each ring present towards the base of the horn. The rings are best noted on the concave side of the horn. The growth of the horn is as follows:—Two small, hard, rounded buttons or points emerge from the skin when the calf is eight or ten days old. At three weeks a little flexible horn has appeared. At five or six months the horn commences to curve and assumes the shape it will eventually have. Up to this time and during the first year the horn is covered with an epidermic prolongation of the skin, similar to that seen on a foal's hoof at birth. This covering dries and scales off by the twelfth or fifteenth month, and the horn has then its permanent natural, shining, tough surface. In the second year the horns start a fresh growth and a small groove is seen encircling it between the substance secreted the first year and that developed in the second. A second ring appears during the third year. These two grooves or furrows around the horn are not well marked, and all traces of them disappear as the animal becomes older. From three years on the growth of the horn is marked by a groove that is much deeper and so distinct that it shows as a plain elevation or ring of horny substance, which forms an accurate basis for estimating the age of the animal. The teeth should also be taken into account when estimating an animal's age.

Northern Sugar Experiment Station, Meringa.

OFFICIAL OPENING.

THE official opening ceremony of the new Sugar Experiment Station at Meringa was performed by the Honourable the Minister for Agriculture (Mr. F. W. Bulcock) on the afternoon of Friday, 13th September, 1935. The Experiment Stations Advisory Board and visiting delegates to the International Sugar Technologists' Conference were present, in addition to a large gathering of local farmers and prominent townspeople.

In a brief address of welcome, Dr. H. W. Kerr (Director of the Bureau of Sugar Experiment Stations) said that the day was a happy one for the Advisory Board and officers of the Bureau staff, as it marked the realisation of a long cherished hope that one day all sugar experimental work in North Queensland would be concentrated at one station. Meringa, he suggested, was admirably suited for this purpose.

Dr. Kerr said it was most appropriate that the Minister should be with them on this occasion, for Mr. Bulcock was largely responsible for the consummation of the plan, and he knew that the Minister would at all times continue to manifest a sincere interest in the activities of the Station, and to lend his keenest co-operation. He had therefore very much pleasure in inviting the Minister to address the gathering and to declare the Station officially opened.

The Minister said it was indeed a pleasing occasion to those who were associated in any way with the sugar industry. This Experiment Station was urgently needed. Up to eighteen months ago, the development of the cultural and plant breeding work had been carried out at South Johnstone, while entomological studies were made at Meringa. The possibilities of any further material advance in our knowledge regarding cultural treatments of the alluvial lands of the Johnstone River were remote, while the red schist soils of the Meringa area demanded intensive study. Moreover, the establishment of one central, highly equipped station, would make for economy in operation and improved efficiency.

In all their endeavours, continued the Minister, they had the ardent support of the Sugar Advisory Board; and it would be admitted that they had co-operated to make the Meringa Station not only the outstanding station in the North, but in Queensland generally. He thought that the establishment of this Station would make a very definite contribution to the welfare of the sugar industry—not only in Queensland but in a very much wider sphere. The knowledge that was obtained here would be of value to sugar growers and experimentists in other parts of the world. They appreciated to the full the value of co-operation, continued the Minister. There was probably no other industry in Australia that would profit to so great an extent by virtue of co-operation and mutual support of those engaged in it, as the sugar industry. One thing they required above all was the co-operation of the Government. Under the financial readjustment plan which had been effected when the Sugar Experiment Stations Act was recently amended, the Government contributed £7,000 annually towards the cost of maintaining

PLATE [illegible].
General View of the Northern Experiment Station, Meringa.

the Experiment Stations. The balance of the money was found by the industry. Whenever anything untoward had developed, the industry had always discharged its obligations in the best possible manner—by bearing its fair share of the financial costs. The Advisory Board, which was constituted of industry representatives, was therefore charged with a very definite responsibility and he could say that they had discharged it admirably.

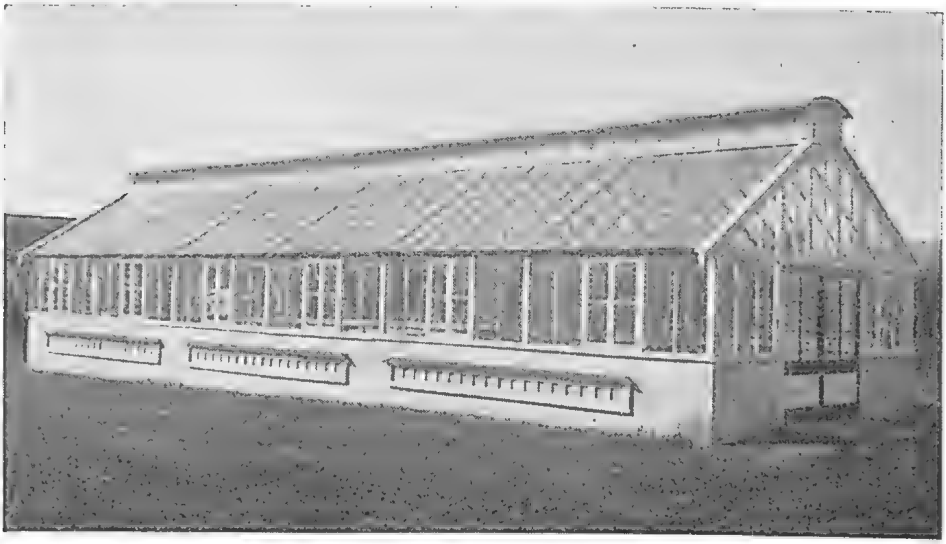


PLATE 224.
The Glasshouse used in Seedling Work.

The Advisory Board consisted of two millers' representatives, one from the north and one from the south, and two growers' representatives, also from the northern and southern cane districts respectively. It was provided that one of the millers' representatives should be nominated by the Queensland Society of Sugar Cane Technologists.

A fact that pleased the Minister was the thorough manner in which the Board carried out its policy—"second best" was not good enough, the best and only the best was their policy. This applied not only on the investigational side of the work, but also on the question of manning their staff and recruiting of their officers. Only that morning the Board had made an important decision regarding the appointment of a University trainee. The Board was certainly making an excellent contribution to the wellbeing of the sugar industry.

Referring to recent advances in knowledge, the Minister stated that such advancement could never have resulted had it not been for those who made a scientific study of the problems confronting them. For that reason, he was particularly pleased to welcome the visiting technologists who were present that afternoon, at the forging of a new link in the chain of sugar knowledge, a link which, adjustable with those links at Bundaberg, Mackay, and Brisbane, was likely to provide the knowledge so essential to the progress of the industry.

The Minister paid a tribute to the excellent work of the staff of the Experiment Stations, and remarked that first-class brains were wanted to tackle the problems which confronted them. They sent their

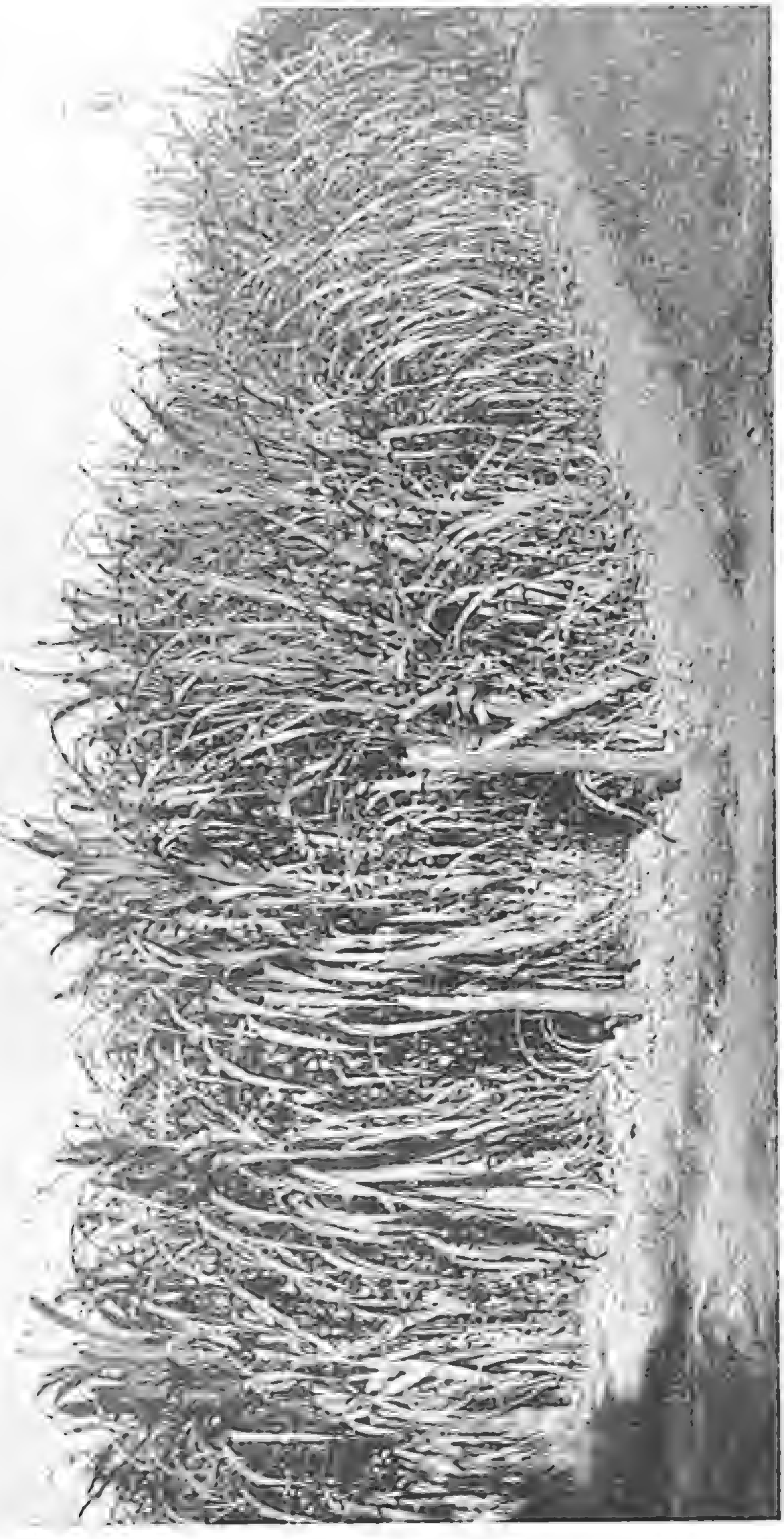


PLATE 22[illegible].

A Block of New Seedlings at Meringa.

officers overseas for training whenever practicable, and in addition, when they found a man with outstanding qualities they endeavoured to give him every opportunity to develop. They could all feel assured that the domestic harmony within the organisation would allow the best results to be accomplished. They were well aware of the many problems

PLATE 226.

Exterior View of Pond and Cage Constructed for the Reception of a Colony of the Giant Toad *Bufo marinus* introduced from Hawaii.

which they had to face and were not victims of the illusion that the sugar industry was a cornucopia from which wealth might be poured at will. However, the sugar industry on the experimental side was one which he thought was more efficient than ony other agricultural industry in Australia. The price of the preservation of the industry was the maintenance of the very highest standards of efficiency, and if they did not practise that efficiency in and out of season, the price of sugar would be much greater than it is at the present time.

Mr. Bulcock made a trenchant attack on those organisations which, fortified with a colossal ignorance, were prepared to come forward and criticise the sugar industry. Presumably they derived some satisfaction from their criticisms and perhaps it was not for him to deny them their pleasure; but he would like to say that the Queensland sugar industry was not the wealthy industry they in their ignorance believed it to be. The income of the average sugar farmer was generally little better than that of the average artisan, and the risks associated with the industry were such that it was a hazardous occupation indeed.

Mr. Bulcock, concluding his address, said that he was particularly delighted, as Minister for Agriculture, at having the opportunity of opening the Station at Meringa. Two years ago he visited South

Johnstone and Meringa, and decided that the centre of activities should be transferred to Meringa. Wonderful progress had been made since that time, and this Station, he thought, would make a very definite contribution to the economic preservation of the industry in North Queensland. He was sorry that the Station was not in "full blast" that day, to allow the visitors to see the work for themselves. He assured the overseas delegates that their visit to the North and the contributions they had made to the industry would not be forgotten. So long as they had the guidance of the Advisory Board backed up by the present

PLATE 227.
Interior View of Toad Pond Showing Spray and Growth of Water Hyacinth.

Bureau staff, he felt the work would progress. They were in process of formulating a long distance research programme, and when this was carried out, research would still continue. He had infinite pleasure in declaring the Meringa Sugar Experiment Station officially opened.

A vote of thanks to the Minister was moved by Mr. Ben Courtice, growers' representative on the Experiment Stations Advisory Board, who referred appreciatively to the work which the Premier and the Minister for Agriculture had performed on behalf of the sugar industry.

CHEAP FERTILIZERS.

In no phase of agricultural practice is the farmer so liable to exploitation as in the purchase of fertilizer, unless he adheres to the policy of purchasing only from a reputable firm, and assists that the labelling of the product is in accordance with the requirements of the Fertilizer Act. Just recently we received a sample of "cheap" fertilizer which a canegrower had purchased; on analysis it proved to be a fairly good grade of common salt, but it was, of course, quite valueless from his point of view.—H.W.K., in the "Cane Growers' Quarterly Bulletin."

Pigs on the Atherton Tableland.

Mr. E. J. SHELTON, Senior Instructor, has supplied the subjoined report.

A SUCCESSFUL year and a range of prices for live pigs comparable with those paid elsewhere throughout the State were notes stressing the value of the pig raising industry and the results of a year's operations at the annual meeting of the members of the Northern Pig Board and the shareholders of the North Queensland Co-operative Bacon Association, held recently on the Atherton Tableland.

During the twelve months ended 30th June, 1935, the Northern Pig Board handled 8,543 pigs, a slight increase on previous years' figures. Of these, 7,218 were graded as first grade, 821 as second grade, 113 as third grade, and 249 for the manufacture of small goods. Generally there was an improvement in type and quality, but the supply is much below Northern requirements, and shareholders were urged to devote more time and attention to the breeding of a better type of pig, for which the Board and Association were quite prepared to find a market at top prices for all quality pigs.

The supply of live pigs to butchers in the North had to be much restricted owing to insufficient being received to allow of that branch of the trade being developed. The average price paid for first grade baconers was 4.83d. per pound, which compares favourably with the average price paid throughout the State. The year's transactions resulted in a slight profit and satisfactory sales, although, as stated above, it was demonstrated forcibly that the supply of pigs materially affects the successful and economic operation of the bacon factory, the maintenance of the local market, and ultimately the price paid to suppliers for their pigs.

With a view to further stimulating and sustaining interest in pig raising, especially in times of food shortage, a scheme was mooted for the establishment of regular pig sales at one of the principal trucking stations, Malanda being mentioned as the most suitable place, the sale yards to be in the nature of a receiving, sale, and despatch depot at which all grades of pigs could be handled and a general interchange of pigs arranged for. It was finally agreed that it be a recommendation to the Northern Pig Board to consider the establishment of pig sales at Malanda, where the farmers could bring their stock for sale or buy store pigs from other farmers.

It was decided also to make a special effort to extend the pig industry in the Tarzali and Jaggan district on the Millaa Millaa line.

Considerable discussion centred around the importance of the fresh pork trade in the North and the necessity for some form of stabilisation of prices paid for pigs supplied throughout the year. There has been a suggestion also that the Board should enter the meat trade and establish a plant for the treatment of calves and dairy cows suited to the manufacture of various meat products. The scheme contemplates the erection at Malanda of a complete plant for slaughtering, freezing, packing, and selling meat products. In line with such a scheme there has been for some time a general desire on the part of many shareholders to have the bacon factory removed from Mareeba (its present position is at

Floreat Siding, about one mile from Mareeba township) to Malanda. However, for the present no move is to be made, the expense associated with such a scheme and the difficulties being a hindrance to progress.

The Queensland Pig Industry Act was discussed, the general (but very erroneous) opinion being that grading and payment on the basis of grade would not be in the best interests of the industry. There are many aspects of this subject which will need to be more fully understood before such an important scheme as grading can be condemned, and it is safe to say that just as a properly organised system of grading and payment on basis of grade is necessary in other branches of agriculture, so it is essential in the interests of the pig industry that the farmer who is breeding choicest quality pork and bacon pigs should be recognised when payment is being made and should be paid a better price than that paid for pigs of inferior quality that are not so suited to market requirements.

It is safe to say that, once the system of grading, which has been provided for, comes into regular operation, opposition from farmers will disappear, for no farmer is going to refuse a better price for a better quality animal.

The Directors of the North Queensland Co-operative Bacon Association and members of the Northern Pig Board are Messrs. R. Campbell (Peeramon) Chairman, J. E. Foxwell (Kureen), D. Johnston (Hillcrest), A. A. Knudson (Millaa Millaa), F. W. Collard (East Barron), and C. Dunlop (Mareeba) Secretary and Manager, with Mr. H. F. Sibley as Government Representative for the current year.

PRODUCTION OF FIRST-GRADE CREAM.

With the coming of summer the dairy farmer's difficulties increase enormously, for high temperatures and other hot weather conditions are so favourable to bacterial growth that additional precautions are essential if quality is to be maintained.

The first step towards controlling the action of bacteria in milk and cream is to prevent such organisms as have gained access to these products from multiplying to sufficient numbers to cause trouble. The only way to do this is to cool the milk or cream as much and as soon as possible. In a climate such as ours, this is one of our biggest troubles.

In the absence of water being laid on to the separating room, any of the small water-bag coolers, to cool the cream straight from the separator or the milk immediately it is drawn, are very efficacious, as every degree of temperature we bring the product below 80 deg. Fahr. will have a retarding effect on the bacterial development, and in many cases (in relation to weed taints, &c.) the aeration will improve the flavour. If a cooler is not available a lot can be done by standing the milk or cream cans in cold water, or putting wet bags round them, but it must always be remembered that fresh water is advisable each day, and the bags should be changed each day and allowed to dry. In the case of cream it should be stirred with a tinned metal stirrer two or three times each day, and not be mixed until each lot of cream is cool. Finally, it should be delivered to the factory daily, if possible.

The production of first-grade cream means:—Thorough and systematic cleanliness; keeping the temperature of the milk or cream as low as possible; delivering the cream to the factory as soon as possible.

Many people, after taking as much care as possible on the farm, allow the cream to become heated in transit to the factory, either by not having a well-shaded stand or, when they do the carting themselves, by not taking the trouble to keep the cans covered (by, say, clean wet bags). This neglect is definitely detrimental to quality, especially in the summer months.

Donkey and Mule Breeding.

By H. J. FREEMAN.

Mr. Freeman, of the Fruit Branch of the Department of Agriculture and Stock, visited the United States of America recently for the purpose of studying methods of fruit production and marketing in that country. Through the courtesy of the Minister for Agriculture, Hon. Frank W. Bulcock, he was commissioned to select three good quality jack donkeys on behalf of Queensland breeders, to be used in the production of draught mules for cane cultivation work.

WHEN in conversation with Colonel Monsees, America's foremost jack and jennet breeder and owner of the Limestone Jack Farm situated at Smithtown, Missouri, he informed me of the following facts regarding the present conditions of the jack industry in America and also of the necessity for the observance of certain characteristics peculiar to this type of stock if successful mule breeding is to be accomplished.

Colonel Monsees said that the production of suitable jack stock is exactly the same task as the breeding and raising of any other kind of valuable livestock, and it can readily be understood that good jack stock is positively of vital importance for the foundation of mule breeding. At present there is a very serious shortage of jack stock in America as well as throughout the rest of the world. The mule market is particularly bare, and I witnessed a contract entered into by the Mexican Government with Colonel Monsees commissioning him to purchase 300 yearlings to two years old of specific type at the rate of 250 dollars (£50) per head. This will clearly demonstrate the present shortage so appreciably acknowledged throughout the United States of America.

From figures presented by Colonel Monsees, I ascertained that at present there are ten jacks in the United States of America to every jennet; nine out of every ten of these jacks are more or less faulty, and at present are over ten years of age. It is evident that the majority of these jacks will die within the next ten years, and from my own observations, backed up by Colonel Monsees' valuable experience, one can realise the scarcity of the young jacks so necessary to take the place of those rapidly passing into decline. It is estimated that if every jennet of breeding age were immediately bred to a suitable jack, at least fifteen years would be required to build up a sufficient supply to satisfy the present demand in America alone.

During the sixty years that Colonel Monsees has been breeding jacks two definite periods of depression have made themselves felt, and the present shortage can be attributed largely to the last lapse of depression which occurred during 1928 and 1929. It was of such a serious nature as to dishearten completely the jack breeders of America, compelling them in many instances to dispose of their stock at such prices as to make the business a disastrous venture. From 1929 onwards only the old established breeders possessed sufficient confidence to persevere in the expectation of better times ahead. Their anticipation has now proved a reality inasmuch as during the early months of this year

buyers came from Spain, South Africa, India, and Mexico in an endeavour to buy suitable jack stock and mules for those countries. The main fact behind this particular period of depression as far as the jack breeders were concerned, was the positive trend towards mechanisation of all phases of agriculture. This particular move was apparently not capable of providing the actual results that were anticipated, for farm

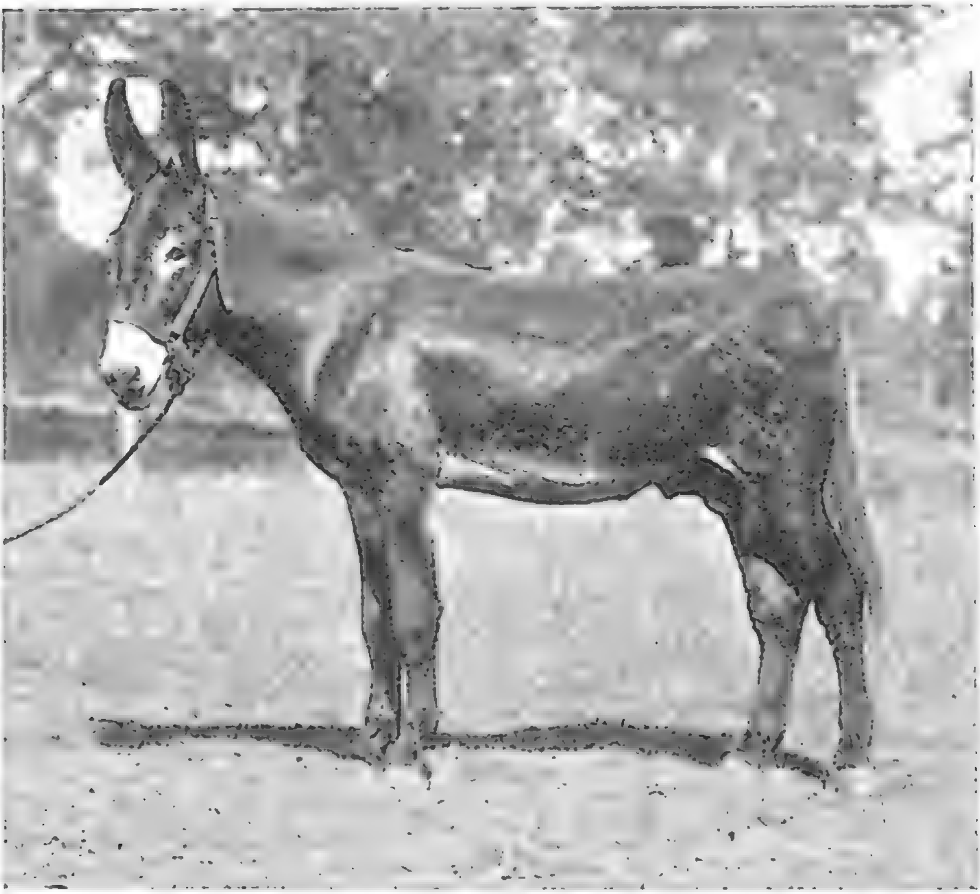


PLATE 228.

"COLLAY," the registered Jack purchased from Messrs. H. T. Hineman and Son, of Dighton, Kansas. This Jack is 15.1 standard measurement, and was foaled in 1928. He has sired many mules of excellent type, and was a noted Jack in the Mid-Western States of America. He is one of the best muscled and boned Jacks that has ever come out of America. This Jack was purchased for the Fairymead Sugar Coy., of Bundaberg.

hands as well as many stock-breeding farm owners were prevented by the disappearance of animals from earning a living, as can be very easily understood. Immediately the raising and working of horses and mules was abandoned, the market commenced to fall and finally crashed, when stock previously worth hundreds of dollars was passed in for values so low as have never been encountered before. Unfortunately, it can truthfully be recorded that many of these men who in those years decided that motive power of the latest type was apparently of vital necessity for those times, are now walking the road, and thus enlarging the army of unemployed.

Donkey Breeding.

I was advised that the principles of the Jack Association of America have been strictly adhered to and that whenever possible one should not consider any other than registered stock. I was next advised that jennets should not be bred until they are at least three years old. They should be tried with a jack, the method being to lead him around in the

PLATE 229.

"BUSINESS," the registered Jack purchased from Colonel L. M. Monsees and Sons, of Smithton, Missouri, bred on the Limestone Valley Stud Jack Farm in that district. This Jack is $15\frac{3}{8}$ hands standard measurement, and was foaled in 1929. He is a noted sire, and is renowned for the action and natural spirit of his progeny. This Jack was purchased for Messrs. P. F. King and M. Ahearn, of Home Hill.

yard or paddock within which the jennets are enclosed and if any of them are in season it will readily be noticed by that particular animal's actions. A jennet in season should be separated from other stock and put in a safe box stall and there left for a day or a night. She should be bred and kept in the stall or in a secure separate pasture away from other stock until she becomes quite normal. She should then be turned back with the jennet herd and should be again tried in from eighteen to twenty-one days. If necessary, the jennet should be bred again and handled as abovementioned. It is necessary that the jennet be handled in this manner throughout the entire season which, in America, continues from the first of April to the end of November. The practice is to observe the herd carefully, and, even though they may all appear to

be in foal, a trial should be made every ten to fourteen days so as to eliminate the risk of a poor percentage of foals. Jennets are harder to settle than mares and only by careful attention will a heavy percentage of foals be obtained. These animals carry their young for twelve months or slightly longer, and should a jennet foal late in the autumn it would not be advisable to breed her again until the next spring.

PLATE 230.

"AJACKS," the registered Jack purchased from Colonel L. M. Monsees and Sons, of Smithton, Missouri, bred on the Limestone Valley Stud Jack Farm in that district. This Jack was foaled on the 24th July, 1933, and, coming from excellent stock, should grow into a very desirable animal; being as yet a baby, he will grow considerably, and it is fully expected that he will sire mule stock that will be the most desirable.

Practice has shown that jennets should be very carefully watched at foaling time, and therefore they should be treated in such a manner as to make them content and easy to handle should they require any assistance at this particular period. As soon as the colt is foaled one should be very sure that the enveloping membranes do not cover its head and nose, for if this matter is not loosened in foaling, the colt may smother

within a few minutes after birth. To avoid infection, the navel should be painted with iodine, and all natural functions should take place within three hours after the foal is born.

If a jennet is to foal in a box stall or a barn, these quarters should be perfectly clean, being first carefully disinfected to destroy any source of infection that may possibly be present. Although this is the practice adopted by many breeders, Colonel Monsees is very much in favour of allowing the stock to foal while running on pastures, particularly so if the weather is mild and all other conditions—good grass and water—are the order of the day. It has been noted that a colt foaled about mid-day with a temperature ranging around 100 degrees, and upon land that is carrying a depth of dust due to drought conditions, will usually die within two or three hours.

Care of the jennet while suckling the colt is an important matter and necessitates hand feeding if grass is not plentiful and succulent. Three to four quarts of oats twice a day is usually sufficient if the pasture is not all that it should be. Naturally a little hay to form a roughage basis is also necessary. It is surprising how very quickly the little colts learn to feed, bran and oats seemingly being their favourite diet.

For the owner of several colts, a creep pen or stall is recommended; the principle of this is that the youngsters can go in and feed at will while the older animals are kept out by the nature of the entrance. Most breeders wean their colts when they are from seven to eight months old, except where the jennet is not in foal; in that event the foal may be allowed to run with his dam for ten or eleven months. During the weaning of the youngsters, the jack colts should be separated from the jennet colts; in separating them, it is necessary to confine them to pastures well away from jennets and mules. It is important that a quiet natured young horse colt be placed with them until they are at least twenty to twenty-four months old. The reason for this is that a jack prefers the company of his own species, and if not able to associate with jennets, prefers the company of a mule to that of a horse. Running with a young horse has the definite action of creating a better relationship between the two classes of animals and prepares the jack for the work for which he is later to be used.

Mating with Mares.

At two years of age these young jacks will commence to assert themselves and, as a consequence, will have to be separated, otherwise they are liable to maim each other by the roughness of their play. As with other classes of valuable animals, both jack and jennet colts should be well fed and cared for in a manner that all stock breeders of experience fully appreciate. One fact well worth recording is that by reason of the peculiar constitution of these animals, very little corn should be fed them; the heating effect of this grain bringing about disastrous results. Oats and bran with good hay are positive essentials for the producing of big strong stock.

During the summer when the young jack reaches twenty-four to thirty months of age he should be afforded an opportunity to serve a gentle mare definitely in season. This action should be accomplished by leading the mare slowly around the paddock and by observing carefully whether or not he is paying her the amount of attention that it is

desirous he should. Let him serve her if he will and repeat for two or three days. If this young animal is eager to perform this function he will definitely be ready for use during the next season; he should be allowed fifteen to twenty mares, being then three years of age or a little older. Another fact well worth recording is that the mare should never in any circumstances be allowed to show her dislike for the jack by attempting to kick him or any such procedure. Should this occur it is very difficult to again persuade the jack to work. For this reason it is always advisable to place any mare that one wishes to have served by the jack in a small crush specially constructed for this purpose; the plan is to arrange the sides of the crush so that a satisfactory breeching can be placed behind the mare, thus allowing the jack free access without any risk of damage to either.

Bearing in mind the recommendation previously made regarding the definite separation of the young jacks from the young jennets or mules, it can be understood that great risk would be involved if one were to let any one of these young jacks associate with either younger or older jennets or mules. If this should happen he will thereafter possess a tendency to prefer these animals and will perhaps cease to work on mares.

Jacks in service should have at least one or two acres of grass in which to exercise. A jack at four or five years of age can be used twice a day, preferably early in the morning and during the latter part of the afternoon. During the breeding season, the jack's ration could consist of oats, pressed wheat and bran, and a liberal supply of good quality hay. Lucerne in quantity is not particularly recommended inasmuch as it has a somewhat depressing affect upon the kidneys. As is the case with all animals, a jack should have an abundance of fresh water and should never be fed more than he is capable of cleaning up at one feed. Many farmers only feed twice a day, morning and evening.

In the breeding of suitable mules, the following points should be observed. *Firstly*: The desirability of this particular beast for farm work; for the mule is the simplest and sturdiest of all draft stock to raise and handle. *Secondly*: Good mules are procurable not only from registered mares but from any grade mare that possesses sufficient confirmation to make her a desirable dam. It has been proved that a mare sixteen hands and weighing twelve to fifteen hundred pounds, with a good body, neck and head, bred with a well developed jack of fifteen to fifteen and one-half hands high, will produce a mule weighing eleven to fourteen hundred pounds at three years of age. Draft mares weighing sixteen to eighteen hundred pounds and bred to similar jacks will produce mules heavier bodied and much bigger in the bone.

Colonel Monsees, through his experience, has proved that the best mules ever bred in Missouri were bred from mares of the standard trotting type and weighing about fourteen hundred pounds. The favourite jack would never measure more than fifteen to fifteen point two standard measurement. Bigger jacks than this are always faulty because of the amount of daylight they have beneath them, and the peculiar characteristic of being awkward and in every way apparently overgrown, always denoting a certain leg weakness not found in the smaller animals.

A mule colt if in a healthy condition and given a plentiful supply of feed can be weaned at seven months, but will never thrive so well if entirely separated as when paddocked or yarded with other babies of his own kind. Although under natural conditions a jack prefers a mule to a horse, the instinct of the dam predominates in the mule; as a consequence mules, whether colts or fully grown, prefer the company of horses to animals belonging to the species of the sire. A contented old mare makes an excellent stable or paddock companion for one or more mule youngsters. It is seldom that these youngsters need longer than three weeks to settle down after being taken away from their dam.

Experience has shown that the best age at which to commence working a young mule is thirty months, and then the work should be only light until the following season. With good feed, reasonable attention, and moderately heavy work, mules should continue to be valuable farm animals until they are fifteen or sixteen years of age.

PLATE 231.

MEMORIAL TO PIONEERS OF THE SUGAR INDUSTRY.

Cairn at Ormiston, near Cleveland, unveiled by the Premier, Hon. W. Forgan Smith, LL.D., on 1st September, 1935, in the presence of the delegates to the Fifth Triennial Congress of the International Society of Sugar Cane Technologists. The memorial is of granite from Giru and Herbert River. Its base of unworked stone, typifying the pioneer days; the column is of partly dressed stone, typifying progress; the coping stone is of polished granite, symbolising the present efficiency of the industry.

The Wood and Water Joey.

An extract from the Fifteenth Annual Report of the Public Service Commissioner, Mr. J. D. Story, I.S.O.

"A wood and water joey"! The prospect of such a career for their son is not alluring to many a town father and mother, and hence their reluctance to permit the boy to take a job in the country even though he may feel the call of the land. The farmer, also, has the reputation of being a hard taskmaster, but, on the whole, he is maligned; of him there is much loose speaking, begotten of loose thinking. Though the producer may growl, he has a lot about which to growl; possibly no section is more the victim of circumstances. The public servant is sure of his fortnightly pay; the producer is not sure of a fortnightly cheque. Employees have the protection of carefully considered and strictly administered awards; the producer has to depend upon Nature and, in a large measure, upon oversea prices. Awards cannot control Nature; industrial conferences cannot influence the seasons; and overseas prices are beyond the determination of local juntas. A five-day week is not for the producer even the scriptural six-day week can be honoured only in spirit. But he has solace in his yeomanry and sturdy independence. Still, I am with the parent who does not want his son to be merely a wood and water joey for the term of his natural life. But the solution does not rest with the farmer and neither does it lie altogether with the parent; even the fairly high-salaried man with several sons and daughters to educate and launch in life cannot provide the whole of the capital with which to buy one of his sons a good farm; and he does not think it prudent to undertake the risks of large liabilities. It is urged sometimes that agricultural college trainees should be given priority privileges in Crown land ballots; but this proposal, besides being unfair in principle, would be largely useless in application. Parents with means and opportunities do not need assistance in settling their sons; but if sons of parents with little means and few opportunities are to be encouraged to leave the towns for the land, the "joey" objection—and it is a valid one—will have to be overcome. In the agricultural colleges, the instruction of the youths is partly academic and partly practical, and the lads work under direction; on the farm the training is practical, but here, too, the trainees work largely under direction. Medical, engineering, and architectural graduates of foresight, who have completed their academic courses, make arrangements, if they can, for full-time practical experience under direction before they embark entirely on their own account in their professions. In this way, these young men get intensive practical experience to supplement the academic courses; thus the gap between the academic and the practical is spanned and they are much better prepared to enter upon the wider professional life. This lead suggests a scheme of "farmlets" for landless youths who have some agricultural training and practical experience but little financial means or backing. The main activity might be pig-raising and fattening, with dairying as an adjunct. The youths, preferably, might work their farmlets, co-operatively, in groups of three or four. To the youth of grit and ambition, the farmlet would lead in time to the man-sized farm; assuming *good* land, good stock, reasonably assured prices, and fair opportunities, the young fellow should be able to make wages and a little over. He would have the satisfaction, too, of working for himself,

fending for himself, and practising that self-help which begets independence. The arrangements for the farmlets would need to be on a kind of three-party basis—the participating parties being the Government, the parents (or sponsors), and the youths. The Crown might provide (even by acquirement) suitable land at a reasonable rental, and great financial assistance on special terms for the purchase of equipment and live stock; the parent (or sponsor) and the youth between them might provide an approved amount of capital to supplement the assistance from the Crown and as a guarantee of good faith. In the early stages of the scheme and in view of its special nature, the Meat Industry Board and the factories might see their way to co-operate in the marketing of the farmlet products to the best advantage. It should be possible to evolve a workable scheme on the lines indicated. Certainly it would be experimental, but a beginning might be made in a modest way; in due course, the practical application of the scheme might suggest something better. But a primary production State should be prepared to take a little risk in so important a primary production matter. A gap is there; it should be filled in. The farmlet would also be a link between Gatton College and the full-sized farm. The proposals contain the elements of education, productive employment, and manly self-reliance. In bush talk, the authorities might take a sporting chance on the lads and—give them a go.

POINTS IN MAIZE PLANTING.

The maize drill is the most satisfactory machine for sowing the seed and fertilizer, but to ensure regularity in the drop particular attention should be given to the plates in relation to the size and uniformity of the grains.

The width of the rows and thickness of sowing in the rows depends on the soil and climate, the variety, and whether the crop is for grain or for green fodder. Rows vary from three feet to four feet six inches apart, and grains are dropped singly every 12 inches or at the rate of two to four grains in hills two to three and a-half feet apart. Under most conditions furrow planting is preferable to surface planting. The average yields obtained in experiments at Hawkesbury Agricultural College on alluvial soils over a period of eight years show an increase of eight bushels 20 lb. in favour of furrow planting.

The depth to plant the grain depends on the soil moisture, the time of sowing and the kind of soil. For example, in early spring, particularly in clay loam soils, seed must not be sown deeply as it may rot in the cold soil. In the late spring and summer, when moisture is not present to such a degree, deeper planting is necessary. It is advisable only to sow when soil moisture conditions are right, and to sow at a safe uniform depth to ensure a thorough germination and a quick vigorous growth of the young seedlings, so that they can rapidly outgrow young weeds. The depth of planting does not affect the depth of rooting, as thought by many farmers.

When germination has been faulty as a result of rain setting the ground just after sowing, faulty seed, or other cause, it is better to resow, if length of season permits, rather than to replant the missing hills or grains. On small areas, if there is any doubt that germination will be satisfactory, the seeding should be heavy, and the surplus and weakest plants thinned out when six to twelve inches in height.

The 1935 Brisbane Exhibition Championship Awards.

PLATE 232.
Mr. Mat. Porter's Berkshire Boar, "Grafton Trump," Winner of Championship and Boar and Progeny Prize.

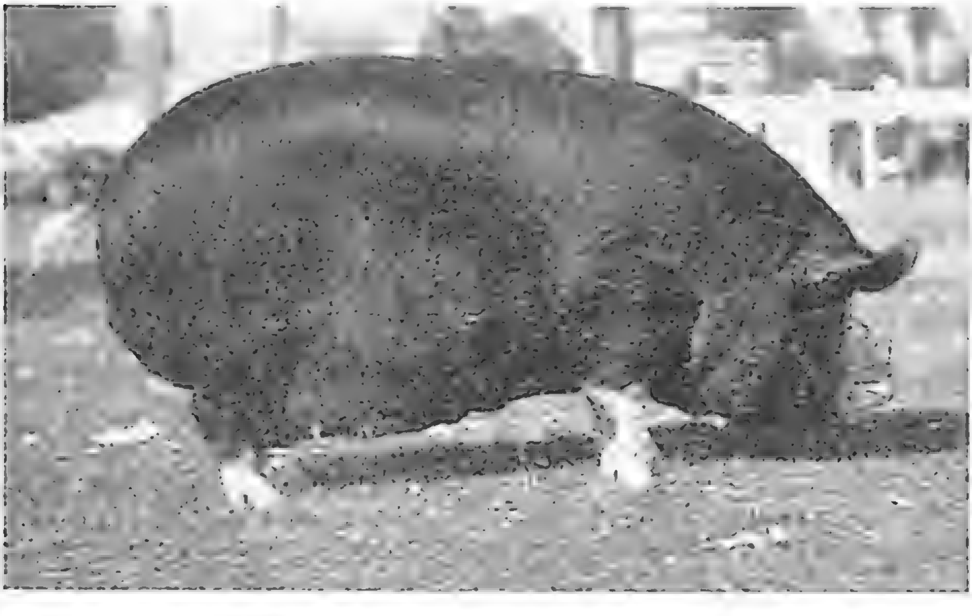


PLATE 233.
Mr. F. Bach's "Lenton Patience" (imp.), Champion Berkshire Sow.

PLATE 234.
Wide Bay Stud Piggery's "Zilvale Skipper," Champion Tamworth Boar.

PLATE 235.
Champion Tamworth Sow, "Wattledale Ruby 2nd," Exhibited by the Wide Bay Stud Piggery, Gympie.

PLATE 236.
Champion Large White Boar—Mr. J. A. Heading's "Gatton David."

PLATE 237.
Champion Large White Sow—Mr. J. A. Heading's "Pine Terrace Pear" (imp.).

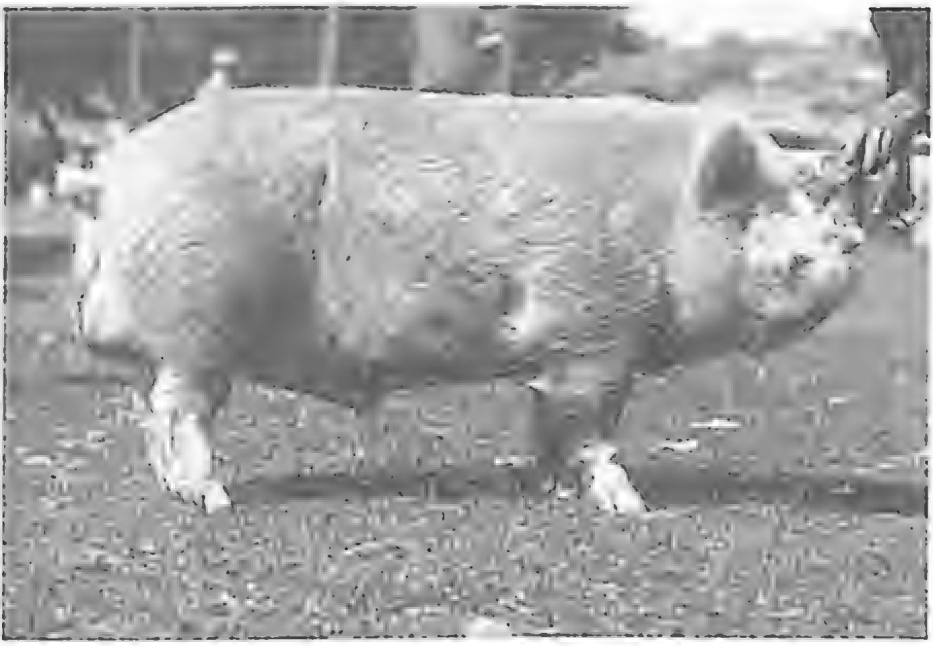


Plate 238.
Champion Middle White Boar—Mr. J. J. Slack's "Norfolk Defiance 3rd."

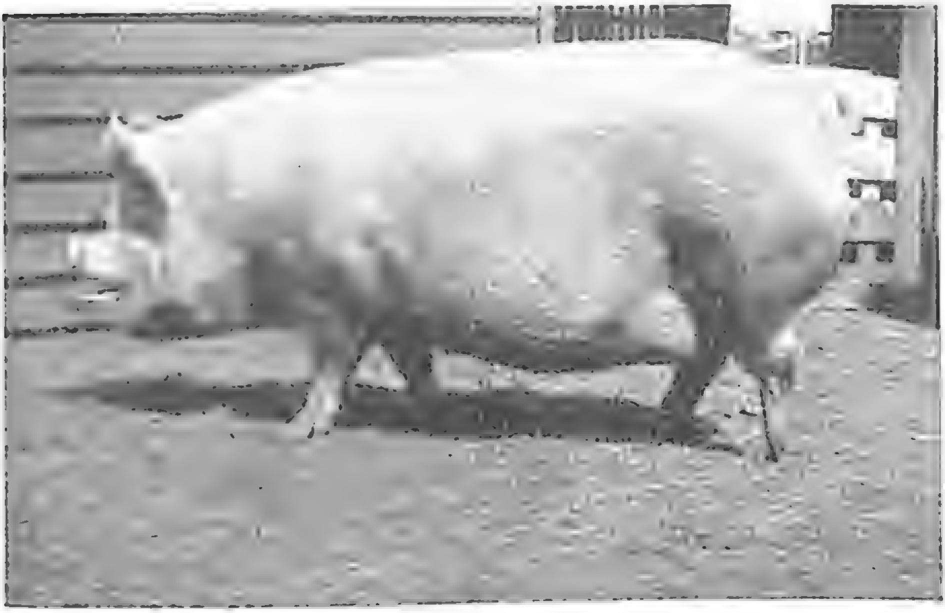


Plate 239.
Champion Middle White Sow—Mr. J. J. Slack's "Dinmore Persellen 2nd."

PLATE 240.
Mr. R. Turpin's Champion Wessex Saddleback Sow, "Maidenbeach Ringouzel" (imp.).

PLATE 241.
J. Barkle's Berkshire Sow, "Cawdor Pride," Winner of Sow and Litter Class.

Plate [illegible].
Jungara Cane lands near Cairns, North Queensland.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of Australian Illawarra Shorthorn Society, Jersey Cattle Society, production charts for which were compiled during the month of September, 1935 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Baby 3rd of Fairfield	Mrs. J. Weber, Peak Crossing	11,263·05	423·541	Fairy Fosh of Fairfield
Lady Myrtle III. of Blacklands	A. Pickels, Wondai	9,667·31	390·515	Red Prince of Blacklands
Wadevale Bella (268 days)	E. Graham, Goomeri	7,930·32	341·412	Lord Carrington of Oakvale
	JUNIOR 4 (UNDER 4½ YEARS), STANDARD 310 LB.			
College Stately	Queensland Agricultural High School and College, Gatton	8,895·26	452·802	Premier of Hillview
Trevor Hill Roseleaf	E. W. Jackson, Nobby	8,036·53	324·783	Gambol of Wilga Vale
	SENIOR 3 (OVER 3½ YEARS), STANDARD 290 LB.			
Pride 12th of Burradale	S. L. Holmes, Goomburra	7,380·25	333·293	Envoy of Burradale
	JUNIOR 3 (UNDER 3½ YEARS), STANDARD 270 LB.			
Melmerle Jennifer	S. L. Holmes, Goomburra	8,265·74	280·813	Wunulla Utility
	SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.			
Ethel 4th of Blacklands	A. Pickels, Wondai	9032·63	359·464	Orama of Blacklands
Hillvale Jenny	Mrs. J. Weber, Peak Crossing	8,071·54	334·274	Marvel of Thorndale
Springlands Champion V. (269 days)	J. Strain, Wondai	7,458·9	327·707	The Hill Hollywood
Rhodesview Fanny 22nd	W. Gierke and Sons, Helidon	7,338·65	311·667	Rhodesview Red Knight
Hillvale Betty	Mrs. J. Weber, Peak Crossing	8,302·4	303·594	Drafter of Greyleigh
Melmerle Rosebud 3rd	S. L. Holmes, Goomburra	7,001·68	291·733	Wunulla Utility
Penrhos Elva 2nd	A. Sandilands, Wildash	6,586·88	270·736	Rosenthal Pendant Prince.

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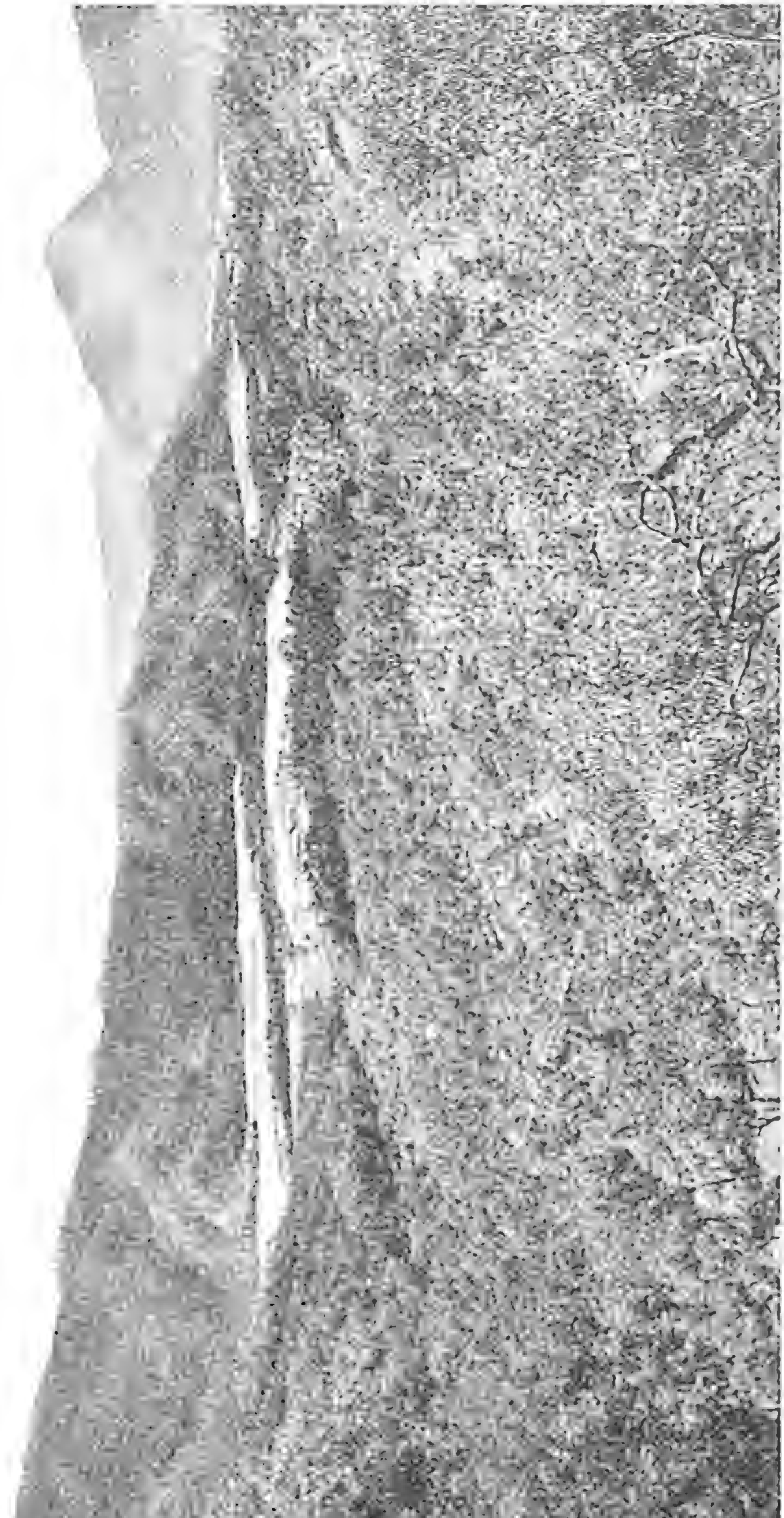
	JUNIOR 2 (UNDER 2½ YEARS), STANDARD 230 LB.			
Rhodesview Nancy 12th	W. Gierke and Sons, Helidon	7,597·01	318·885	Prospector of Blacklands
Sunnyview Fairy Floss	Rex Tweed, Kandanga	7,506·35	313·907	Jellicoe of Headlands
Morden Pansy 5th	R. Mears, Toogoolawah	7,441·65	310·906	Jupiter of Morden
Melmerle Countess	S. L. Holmes, Goomburra	7,072·4	298·271	Wunulla Utility
Marn Bess	R. Martin, Biggenden	6,707·85	296·83	Gentle Victory
Melmerle Polly	S. L. Holmes, Goomburra	6,752·3	280·352	Wunulla Utility
Penrhos Merle 2nd	A. Sandilands, Wildash	6,783·9	260·205	Rosenthal Pendant Prince
Melmerle Holly Hock	S. L. Holmes, Goomburra	5,904·25	248·202	Wunulla Utility
Melmerle Sunflower	S. L. Holmes, Goomburra	5,702·48	238·608	Wunulla Utility
	JERSEY.			
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Lady III. of Hillview (365 days)	A. Geritz, Oakfield	10,744·94	563·493	Playlad of Hillview
Wyreene Toddles	J. B. Keys, Gowrie Little Plains	6,210·59	382·67	Trinity Conqueror
Dorothy of Southport (270 days)	G. H. Gibson, Kingaroy	7,056·9	355·761	Werribee Twylish Starbright King
	SENIOR 4 (OVER 4½ YEARS), STANDARD 330 LB.			
Trecarne Milk Girl 3rd	D. R. Hutton, Cunningham	7,541·13	465·97	Trecarne Golden King
Lilybright 3rd of Hillview (267 days)	A. Geritz, Goomeri	6,980·85	408·497	Mike of Hillview
Silvus of Calton	A. Geritz, Goomeri	6,177·18	389·298	Retford Meteor
	SENIOR 3 (OVER 3½ YEARS), STANDARD 290 LB.			
Lady Betty of Homeleigh (365 days)	A. L. Walker, Dawn	7,881·9	461·432	Orleigh Golden King
Wyreene Pet	J. H. Keys, Gowrie Little Plains	6,532·02	336·771	Goldfinders Prospector of Morago
	JUNIOR 3 (UNDER 3½ YEARS), STANDARD 270 LB.			
Carnation Butterfly 2nd	P. Spresser and Sons, Redbank	4,871·24	282·601	Carnation Prince
	SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.			
Melba of Woodlands	D. R. Hutton, Cunningham	6,014·47	309·546	Prince of Woodlands
Balmoral Pride 2nd	H. B. Roberts, Maleny	5,243·95	250·02	Acaster Master Prince
	JUNIOR 2 (UNDER 2½ YEARS), STANDARD 230 LB.			
G. H. Frailty 8th	Cox Bros., Maleny	4,218·25	273·635	Retford Royal Altavist
Glenview Opal	W. S. Kirby, Byrnestown	4,539·19	256·79	Glenview Goldfinder
Balmoral Beauty	H. Roberts, Maleny	4,798·25	233·187	Acaster Master Prince



Looking over the Little Mulgrave Valley from the Range Road—Cairns to the Atherton Tableland.

PLATE 244.
Barron River, near Kuranda, North Queensland.

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of Mr. C. T. White, F.L.S., Government Botanist.

Black Bindweed.

G.A.D. (Wallumbilla)—

The weed represents the black bindweed (*Polygonum convolvulus*), a very common weed in the warm temperate regions of the world, causing serious trouble by climbing round the grain crop and pulling it down; also robbing the soil of a good deal of nutriment. The weed is a particularly bad one on account of the hard seeds retaining their vitality in the ground for a long time. The usual method of eradication is to induce germination, and then hoe or plough the seedlings in. The plant usually seeds before the crop matures and the seeds fall to the ground; or where it does not, they may be harvested with the crop and pass through animals unharmed, germinating in the manure. The plant is not known to possess any harmful properties, but the seeds are hard and sharp-pointed and may cause mechanical injury, exhibiting itself as a form of enteritis in affected animals.

Mulga and Myall.

E.P.L. (Roma)—

1. Mulga seeds from Woy Woy, New South Wales, would, of course, not be gathered there, but would be collected in Western New South Wales and would be suitable for sowing at Roma.
2. We have no literature dealing with myall and other edible trees.
3. Myall seeds are listed by Messrs. A. Murphy, Woy Woy, at 3s. per oz. or £1 per lb., and mulga seed at 2s. an oz. or 14s. per lb.
4. Your best plan would be to sow the myall seeds in garden plots and later transplant out to permanent positions. Myall and mulga are species of wattle or acacia and the seed of these trees requires special attention in growing. In nature, they often follow on after a burn, the seedcoat being hard is cracked by the fire. At other times the soil is sufficiently hot and moist to effect germination without any other heat. For example, you have perhaps seen mulga and myall seedlings come up where protection from stock has been afforded. The common practice is to put the seeds into a receptacle and pour boiling or nearly boiling water over them, allowing them to soak in the hot water for twelve to twenty-four hours. A system that has been recommended is to sow the seeds, covering lightly with soil about ½ to 1 inch, and then watering the pan or seed-bed with boiling water and covering with a few corn sacks to keep the steam in. This is said to assist germination and the young trees will grow up very quickly. Various distances apart are recommended for planting the trees. We think anything from 12 to 20 feet would be suitable, as the trees would not grow as big as under natural conditions; some of the large mulga trees, of course, being a considerable age.
5. A tree which we are rather anxious to see planted in the West is the so-called Portuguese elm (*Celtis sinensis*). Stock are particularly fond of the leaves of this plant and we have seen it grow very well about Dalby. We don't remember seeing it anywhere in the neighbourhood of Roma, but it should grow there quite well. Seed is, generally, not obtainable through the ordinary commercial channels.

Regarding leafy trees. One specimen we remember seeing about Roma was the bellasombra, or *Phytolacca dioica*. Seeds of this tree are obtainable from R. Dick, Purga, via Ipswich; price, 2s. a large packet.

Kurrajong and bottle trees, of course, do very well about Roma and both are well-known fodder plants. Seeds of bottle trees are not generally obtainable through the ordinary commercial channels, but seeds of the Kurrajong can be obtained. Both Messrs. A. Yates and Co., of Sussex street, Sydney, and Mr. A. Murphy, of Woy Woy, list seeds in their catalogues. These, we think, would be well worth planting as they grow much quicker than the myall or mulga and their allies. Of course, they are excellent fodders. All trees mentioned, other than the mulgas and the myalls, should be planted no less than 30 ft. apart.

Monkey Vine.

A.J.H. (Daymar)—

The specimen represents *Lyonsia eucalyptifolia,* sometimes called "Monkey Vine." It is a very common vine in parts of Western Queensland and New South Wales, producing a great amount of foliage and generally regarded as excellent sheep feed. It has been found from experience, however, that it is poisonous to feed it in large quantities when fresh and that it is better to cut it and let it to wilt for at least 24 hours, preferably longer, before feeding. Whether it contains a poisonous property or causes death simply by bloat is not known.

The Luck of Four-leaved Clover.

J.R.McC. (Mackay)—

The specimen of four-leaved clover forwarded by you is rather interesting. There is a superstition that the four-leaved clover brings good luck and now and again we have had people come to the gardens where clover is very common in the lawns, and by looking assiduously they generally manage to find an odd leaf or two. This superstition has been brought from the Old Country and in a book on the flowers and plants of Great Britain by Anne Pratt, who specialises in the folk-lore attached to the plants, it states among other things, "Melton in his 'Agrologaster,' says, that 'If a man walking in the fields finds any four-leaved grass, he shall, in a short while after, find some good thing'." In Herrick's "Hesperides," too, we find a slight allusion to this:—

"Glide by the ranks of virgins then and passe
The shoures of roses, lucky four-leaved grasse;
The while the crouds of younglings sing,
And drown ye with a flourie spring."

How to Send Specimens.

E.L.L. (Mount Isa)—

We will be pleased to identify any specimens of grasses, herbs, or shrubs you care to send for identification. Of grasses a stalk, doubled up backward and forward so as to wrap up in a piece of newspaper, should be sent. It is as well to enclose a few additional seed heads. Of shrubs, trees, herbs, &c., a shoot a few inches long bearing leaves and, if possible, flowers or seed pods should be forwarded. As you are some distance from Brisbane you will find they will travel much better if you press them between sheets of newspaper for a few days before sending. When dry, number each specimen and retain a duplicate, when names corresponding to numbers will be returned. Grasses are much easier to identify when pressed flat rather than when doubled up in a sheet of newspaper, but perhaps this is too much trouble for you. No charge is made for this service.

Pittsworth Plants Identified.

P.R. (Pittsworth)—Your specimens have been determined as follows:—

1. *Sisymbrium orientale.* A species of Mustard Weed. A very common farm weed in Queensland. It taints milk, but is not known to be harmful or poisonous in any way.
2. *Swainsonia galegifolia.* A variety of the Darling Pea. This particular form is common over a large area of forest country in South-east Queensland, but we have not heard of it affecting stock to any great extent.
3. *Myoporum debile.* A small plant very common in Queensland. It is not known to possess any poisonous or harmful properties. We have not heard of a local name given to it.
4. *Gnaphalium japonicum.* Cud Weed. A very common weed not known to possess any poisonous or harmful properties.
5. *Centipeda orbicularis.* Sometimes called Snuff Weed. It has been accused of poisoning stock on occasions in Queensland, but nothing very definite is known about this plant. We are rather doubtful about it being eaten in sufficient quantities to cause trouble.
6. *Stachys arvensis.* Stagger Weed. We have never known this weed to definitely cause trouble among resting cattle. It affects working stock or travelling stock. Stock have to be excited or worked or driven before the poisonous symptoms become manifest.

Johnson Grass.

J.H. (Chowey)—

The specimen represents Johnson grass (*Sorghum halepense*), fairly common as a weed of cultivation in many parts of Queensland. It is very difficult to eradicate, once it gets into a field as every piece of the white underground runners that are cut is capable of forming a new plant. Johnson grass has been spoken highly of as a fodder on different occasions, but like other members of the *Sorghum* family is possesses a prussic-acid-yielding glucoside, and is dangerous to feed unless cut in the flowering stage, or allowed to wilt a little before feeding. Cattle should not be put on it on an empty stomach.

Hexham Scent and Milk Taint.

R. McG. (Leyburn)—

The specimen represents *Melilotus parviflora*, a melilot or Hexham scent, a very common weed in parts of South Queensland at present, particularly on the Darling Downs between Warwick and Toowoomba. It was boomed as a fodder a few years ago, under the name of "King Island Melilot," and has the advantage that it will grow in soils where lucerne and some other legumes will not thrive. It is an annual, and dies out at the approach of hot weather towards the end of this month or nearly November. The plant is quite useful for grazing, but animals have to become accustomed to the peculiar odour and taste, and it is unsuitable for dairy cattle, as it causes a peculiar flavour in the milk and cream.

Cluster Clover.

C.A. (Nethendale)—

The specimen represents cluster clover (*Trifolium glomeratum*), one of the best annual clovers grown in Queensland. It grows up well during the late winter and spring months, and dies off about the middle of November. It is very palatable and nutritious, and stock are very fond of it. Seed is obtainable through ordinary commercial channels. It should be sown during April or May.

Knot Grass or Knot Weed.

W.A. (Wallumbilla)—

The specimen represents knot grass or knot weed (*Polygonum aviculare*), a very common weed at times on the Darling Downs, and some of the cooler parts of Queensland. It is not known to possess any poisonous or harmful properties, but its long procumbent runners are very fibrous when old, and if eaten in this state by stock may cause impaction. It is at times rather a troublesome weed, and it is as well to eradicate it, if possible, when it first makes its appearance.

Red Ash or "Sarsaparilla." Mackay Cedar.

O.B. (Calen, N.Q.)—

Your specimen is certainly not Poison Peach, but is *Alphitonia Petriei*, commonly called red ash or sarsaparilla. The tree is also probably called peach leaf cedar, but quite likely this name is used for totally different trees as vernacular names vary so greatly in different localities. The plant is not poisonous or harmful in any way and is, in fact, one of the best native fodder plants we possess, all stock being particularly fond of it. The name "sarsaparilla" is given to it on account of the fact that young bark when pulled off is noticed to possess a very strong scent of sarsaparilla.

We will always be glad to name and report on any specimens you care to send. Pieces such as that you send are excellent for determination and quite acceptable for our Herbarium.

Mackay cedar is *Albizzia Toona*. The genus *Albizzia* is very closely allied to *Acacia* and the Mackay cedar is sometimes known as acacia cedar. If you could send a few flowering sprays of this tree at some time the favour will be very much appreciated.

"Goosefoot" or "Fat Hen."

E.O.S. (Chelmer)—

It is rather difficult to name weeds in the seedling stage, but we have no doubt that the specimen forwarded by you represents the goosefoot or fat hen (*Chenopodium murale*), a common European weed quite naturalised in Australia. It is not known to possess any harmful or poisonous properties, but, like some other closely allied plants, gives a rather peculiar weedy taint to milk and cream.

Mat Grass.

F.S. (Cooroy)—

The botanical name of "mat grass" is *Axonopus compressus*. It was described originally from Central America and is a native of that country, but extends some little distance into South America and into Southern United States. We do not know how it became introduced into Australia, but it has been here for a great number of years, especially in Northern Queensland. It was boomed some years ago as a fodder and certainly some of it was planted both in the Northern Rivers of New South Wales and Southern Queensland. Strange to say, it is regarded as a good fodder in the United States and in official bulletins is recommended as a good fodder in Florida and States adjacent thereto. Its eradication is extremely difficult. In small patches, of course, it can be cut out or kept down with a fairly heavy dressing of waste salt such as butchers' salt. The only method of control in large areas is to plough it out and replace with some more vigorous grass.

Weeds Causing "Staggers" in Stock.

S.M. (Wooroolin)—

The two specimens have been identified as under:—

(A) Stagger Weed (*Stachys arvensis*).

(B) Dead Nettle (*Lamium amplexicaule*).

Both of these plants cause staggers in working stock. The Wild Mint mentioned is a different plant. The only known method of combating it is intensive cultivation and chipping.

Milk Tainting Weeds.

Inquirer (Brisbane)—

The plant specimens have been determined as—

1. *Lepidium ruderale*, Pepper Cress.
2. *Apium leptophyllum*, Wild Carrot.
3. *Senebiera didyma*, Wart Cress.

These are all weeds belonging to the *Crucifer* family, and they are known to cause taints in the flavour of milk and cream.

Darling Pea.

H. H. McG. (Hampton, Crow's Nest Line)—

The specimen is the Darling pea or indigo (*Swainsona galegifolia*). This plant is poisonous to stock. Sheep and cattle which eat it fairly consistently are affected by a peculiar nervous disorder brought on by this plant. Mostly stock avoid it, but occasionally they develop a morbid appetite for it, hence the designation "pea eaters" or "indigo eaters."

Grasses from South Burnett Identified.

D.D. (Romina, via Goomeri)—

1. *Cyperus gracilis*, a sedge not a true grass.
2. *Calamagrostis filiformis*, Blown Grass. This is very common in damp places, especially round billabongs, melon holes, &c., round the edges of lagoons and similar places. It comes up with the spring rains, but soon dies off. While it lasts it is quite a good fodder.
3. *Arundinella nepalensis*, a native grass for which we have not heard a common name. It is very common in some of the forest country of Queensland, particularly in sandy places, on hillsides, &c. It is a coarse, cany grass, and is only eaten by stock in the absence of other feed.
4. *Echinopogon nutans*, Rough Bearded Grass. A fairly common grass in Southern Queensland. It favours rather shady situations, and in such places is a useful addition to the mixed pasture.

General Notes.

Staff Changes and Appointments.

Mr. L. L. Manchester, District Stock Inspector, has been transferred from Mareeba to Charleville.

Mr. B. R. Butler, Patrolman, care Main Roads Work, Ravenshoe, has been appointed an Honorary Ranger under "*The Animals and Birds Acts and the Native Plants Protection Act.*"

Mr. N. E. Sutherland, Acting Clerk of Petty Sessions, Nambour, has been appointed Chairman of the Moreton Local Sugar Cane Prices Board, and an agent of the Central Sugar Cane Prices Board, for the purpose of making inquiries under Section 5 (2A) of the Regulation of Sugar Cane Prices Acts in regard to sales and leases of assigned lands.

Acting-Sergeant G. L. Jaques, Windorah, has been appointed also an Inspector of Brands.

Mr. T. B. Austin, The Kiosk, Elliott Heads, Bundaberg, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Fruit Fly Eradication.

In October, 1934, a Proclamation and Regulation were issued under "*The Diseases in Plants Acts,*" declaring the Stanthorpe, Warwick, and Killarney Districts to be a quarantine area on account of the presence of fruit fly, and prescribing the nature of the quarantine to be imposed in such area. It was compulsory for fruit growers in those districts to place and maintain traps, charged with an approved fruit fly lure, in their orchards throughout the last fruit season. Executive approval has now been given to the issue of another Proclamation and Regulation similar to the foregoing with respect to luring for fruit fly control in the Stanthorpe, Warwick, and Killarney districts during the forthcoming fruit season. The new regulation will be operative as from 1st October, 1935.

Barley, Butter, and Cheese Boards.

Orders in Council have been issued in pursuance of the provisions of "*The Primary Producers' Organisation and Marketing Acts, 1926 to 1932,*" extending the operations of the Barley, Butter, and Cheese Boards. The Barley Board's period of extension is from the 24th April, 1937, to the 23rd April, 1942, and those of the Butter and Cheese Boards from the 1st October, 1935, to the 31st December, 1935.

Northern Pig Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Northern Pig Board for the period from 1st January, 1936, to the 31st December, 1940. A petition for a ballot as to whether or not the Board shall be extended for such period may be lodged by growers on or before the 18th November, 1935.

Broom Millet Board.

The only nominations received for the election of two growers' representatives on the Broom Millet Board were Messrs. Henry Jacob Scholl, Binjour Plateau, and Henry Zischke, Hatton Vale.

Mr. Hans Niemeyer, the present chairman of the board, did not nominate. The appointment of Messrs. Scholl and Zischke will be made at a later date.

Dairy Stabilisation Board.

An Order in Council has been issued in pursuance of the provisions of "*The Dairy Products Stabilisation Act of* 1933," extending the operations of the Dairy Products Stabilisation Board until the 31st December, 1935. The personnel of this board consists of the members of the Butter Board and two representatives of the Cheese Board, namely: Messrs. J. Purcell (Toowoomba), W. J. Sloan (Malanda), R. M. Hill (Bororen), J. McRobert (Maryborough), T. F. Plunkett (Beaudesert), A. G. Muller (Fassifern Valley), E. Graham (Director of Marketing), H. T. Anderson (Dalby), and A. J. Harvey (Pittsworth).

List of Licensed Farm Produce Agents, Brisbane:—

Addis Brothers.
Allen, J.
Anderson, Edward Arthur.
Archer and Goss.
Arkell, W., and Sons.
Australian Fruit and Produce Co.
Barnes and Co. Pty. Ltd.
Barr, A. S.
Barron, Orr, and Co. Pty. Ltd.
Barter, G. and W.
Bowden, T. S. and Co.
Burns, Philp and Co. Ltd.
Burrell, Fenton and Co. Pty. Ltd.
Carseldine, Arthur W.
Carter, Alfred J.
Chave, A. E.
Clark and Jesser.
Collard and Mackay.
Comino Bros. Pty. Ltd.
Committee of Direction of Fruit Marketing.
Cooksley and Co.
Cooper Bros.
Copp, R. E.
Cranley, J. P., Pty. Ltd.
Cripps, William.
Dairy Products Co-op. Co. Ltd.
Dalgety and Co. Ltd.
Davies, W. C., and Co.
Dean, Henry and Sons, Pty. Ltd.
Dinneen, Leslie.
Donald, John Simpson.
Donnellan and Co.
Edward, George.
Eriksen, Hans P.
Evans, Arthur L.
Evans, Norman.
Farmers' Co-operative Distributing Association of Queensland, Ltd.
Foggitt, Jones Pty. Ltd.
Foley Bros. Ltd.
Fong Pie and Co.
Gall, George.
Geeves, Hedley. Pty. Ltd.
Gesler, Fredrick C.
Good, D. E.
Guinsberg, Israel.
Hall and Pascoe.
Harris, H. N., and Co.
Hodges and Pratt.
Houghton, E. H.
Hutton, J. C. Pty. Ltd.
Izatt and Johnson.
Jacklyn and Jacklyn.
Jackson, J. and Co. (Produce and Seeds) Pty. Ltd.
Johnson and Markwell, W.
Johnston, Adam.
Johnston, Reginald W.
Johnston, William.
Jordan, Ernest Arthur.
Justins and Finlayson.
Kellie, Francis Hope.
Laidlaw and Co., G.
Lambert, G. and W.
Leavy, James H.
Livingstone, J. R.
Lloyd, Margaret.
Luxford, Sydney.
Mackay, William M.
Male, Joseph Norman.
Mant, Charles O.
Martin and Co.
Matthews, John.
Mendoza and Wright Pty. Ltd.
Murray, John.
Murray Bros.
McCausland, Louis J.
McCook Bros.
McCowan and Hammond.
McDowall, Edward T.
New Zealand Loan and Mercantile Agency Co. Ltd.
Nicholson, Alphonso.
Pettigrew and Wilson.
Plint, H. C.
Potter, W. E.
Robinson and Laidlaw.
Robsons Pty. Ltd.
Russell, H. M., and Co. Pty. Ltd.
Scott, Garrad and Co.
Sellars, R. B.
Sellars, Derek P.
Shay, Percy R.
Sibley, P. C.
Siemons Pty. Ltd.
Skinner, P. J.
Stanton Bros.
Stanton, Harry.
State Produce Agency Pty. Ltd.
Sutton Bros.
Tacey and Eyre.
Thorpe, H. W.
Wanless, Thomas H.
Watson, W. P. and Co.
Whatling, E. H. R.
Wiltshire, F. C. G.
Winters, Edward.
Wool, A. E.
Wool, H. L.
Yow Sang and Co.

List of Licensed Farm Produce Agents.

Backhouse, J. J. C., Killarney.
Berlin, E. A., Marburg.
Black, H. L., Mackay.
Brand, Thomas, Mackay.
Curtis, W. E. and Co., Bundaberg.
Dawson, Joseph, Rockhampton.
Elwing, James Archibald, Rockhampton.
Farrelly, Eugene Andrew, Mackay.
Featherstonaugh, Albany, Roma.
Goltz, F. W., Mackay.
Good, D. E., Rockhampton.
Gore, Arthur Charles, Cambooya.
Gore, Edward and Co.
Gower, H. R., Rockhampton.
Haigh, E. V., Ipswich.
Harding and Walker, Ipswich.
Heers, J. W., Coominya.
Johnston, H., Rockhampton.
Jones, J. E. L., Gladstone.
Joyner, R. G., Gladstone.
Lee Sang and Co., Cairns.
Leonard, T. J., Mackay.
Leong Sun, Townsville.
Limpus, Bert, Bundaberg.
Limpus, C. M. and Co., Bundaberg.
Lindemann, C. H. D., Lowood.
Manz, Walter, Lowood.
Mar Kong, Townsville.
Maxwell, Samuel, Warwick.
Olsen, A. E., Killarney.
Poll and Co., Wynnum South.
Porter, William George, Mackay.
Profke, Albert, Lowood.
Reason, S. C., Killarney.
Redmonds Pty. Ltd., Bundaberg.
Reeds Pty. Ltd., Maryborough.
Rex, J. W., Maryborough.
Reye, C. A. H., Townsville.
Richardson, A. H., Rockhampton.
Robinson, John, Toowoomba.
Stewart, D. H., Toowoomba.
Tatnell, W. R., Gympie.
Thomas, D. B., Gympie.
Thomas, George, Gympie.
Thomas, L. J., Gympie.
Thompson, Sydney, Warwick.
Thorpe, T. E., Townsville.
Tong Sing and Co., Cairns.
Townsville Fruit Exchange, Townsville.
Tung Yep, Cairns.
Turner, George Baden Powell, Bowen.
Walker, E. E., Gympie.
Walker, Shaw, Townsville.
Walters, W. J., Lowood.
Warrys Pty. Ltd., Maryborough.
Waters, Punzell, and Williams, Mackay.
Wilkinson, Joseph John, Nambour.
Wilson, John, Kingaroy.
Young, William, Rockhampton.

Provisional Maize Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Provisional Maize Non-Marketing Board, by extending the term of the Board for a further period of twelve months, that is, until October, 1936.

Cotton Board.

An Order in Council, giving notice of intention to extend the operations of the Cotton Board from the 1st January, 1937, to the 31st December, 1941, has been issued. A petition on the question of whether or not the Pool Board shall be extended for such period may be lodged by growers on or before the 11th November next.

The constitution of the Cotton Board at present provides that members of the board shall be elected biennially, with the exception that those elected in 1936 shall hold office for one year only. An amending Order in Council has also been approved, which cancels the latter provision, thus ensuring that members of the Board shall hold office for a period of two years, as previously.

Animals and Birds Sanctuary near Tamaree.

An Order in Council has been issued in pursuance of the provisions of the Animals and Birds Acts, declaring Miner's Homestead Lease No. 5533, held by Mr. R. A. Blake, Stony Creek, near Tamaree, to be a sanctuary for the protection of native animals and birds.

Animals and Birds Sanctuaries at Hughenden and Mackay.

Orders in Council have been issued in pursuance of the provisions of the Animals and Birds Acts, declaring Rosevale Station, Hughenden, and the property of W. J. Patullo, Eungella, via Mackay, to be sanctuaries for the protection of native animals and birds.

Rural Topics.

Points in Feeding Whey to Calves.

Calves do well on whey and soon grow to relish it. The principal points to be observed are as follows:—

1. Break in the calf gradually to drinking whey after having been started on milk. The same process as in the case of skim-milk should be employed, but care must be taken to boil the milk to prevent it coagulating when mixed with the whey.

2. Guard against bloat caused by too high acidity in the whey.

3. See that too much water has not been added to the whey to reduce and retard acidity when cooking the curd.

4. Provide a good, well-boiled porridge to be added to the whey.

As some time necessarily elapses after the whey is drawn from the vats, before it is fed to the calves, the progress of acidity should be checked by boiling the whey. The use of molasses with whey is also recommended.

Cow's Record—3½ Tons of Butter in 10 Years.

A fifteen-year-old Guernsey cow, Parson's Red Rose 20th, of the New South Wales Department of Agriculture's stud at the Wollongbar experiment farm in ten lactations under official test has produced an aggregate of 53¾ tons of milk and butter fat, equivalent to 3 tons 8½ cwt. of butter. This does not take into account production during unrecorded intervals. This veteran cow holds the production record for the Guernsey breed in Australia, her yield for 365 days as a six-year-old being 17,252 lb. of milk of 6.2 test, equivalent to 1081.17 lb. of butter fat. Parson's Red Rose 20th was born on March 6, 1920, and as a junior two-year-old achieved the excellent record of 10,911 lb. of milk, equivalent to 627½ lb. of butter fat, in 365 days. She completed her tenth lactation test last month, and apparently still has some years of productive usefulness ahead of her.

Keep the Farm Horse Fit.

The horse should be groomed carefully in the springtime when at hard work and sweating profusely. The skin cannot perform its functions properly unless it is kept clean. Shoulders and neck are liable to be chafed with the collar if grooming is neglected. Keep the horse fit at the busy season at all hazards. Feed him generously, but take care to reduce his corn ration on idle days. The feeding on Saturday evening should always be more sparing in oats than throughout the week. Monday morning trouble would be less common if the horses were somewhat stinted on Sundays. Watering should be attended to regularly. Water before feeding grain. When a horse is overheated at hard work, by no means allow him to take his fill of water. A bucket is quite enough until he has cooled down. An exhausted horse should not be fed a full measure of corn nor should his manger be stuffed with hay. Give him a very light feed at first, and, better still, let him munch a handful of hay. After he has rested for about an hour, he may receive a full feed of oats. A little and often is the golden rule to keep the horse fit.

Tormenting Flies.

In the hot weather flies may become a terrible nuisance. They pester live stock. They even prevent animals from thriving. They have the effect of lowering milk production. They also carry and spread infection.

The wading of cattle in brooks and muddy ponds is often done with the object of getting away from their tormentors; and it is well known that one of the causes of ropy milk is due to organisms which may have come from the animals wading in muddy water. It is very difficult for a human being to judge the extent of the reactions of an animal to any particular annoyance, pain or suffering.

On the farm it is not possible to do much to reduce the number of flies where cattle graze, but at least something can be done to see that the cowshed is a place of peace and comfort when the milking herd is in it by taking steps to keep out or get rid of the flies, by keeping the manure heap as far away as possible, and from time to time treating it with some suitable preparation.—"The New Zealand Farmer."

"Dairy Temperament" in Cows.

On field days with live stock one usually hears demonstrators refer to the "dairy temperament" of cows. This means the stimulus to convert the nutrients into milk rather than into body fat. This stimulus is an inherited quality, and is found in animals whose ancestors have been bred and selected generation after generation for high milk production. Certain cows with a strong ability to produce milk are at times inclined to produce more milk than is warranted by their feed consumption. Such cows, after calving, usually draw on their body tissues and lose weight. If, at any time, the feed supply is limited, cows with a good dairy tendency use their body tissue for milk, and become very thin. Under the same conditions cows lacking this characteristic tend to reduce their milk flow rapidly and become dry.—"The New Zealand Farmer."

Fruit Distribution Scheme.

From "Hansard":—

Mr. HILTON (*Carnarvon*) asked the Secretary for Agriculture—

"1. How many cases of fruit and vegetables have been disposed of under the fruit distribution scheme which was inaugurated in January last?

"2. What were the principal centres at which this fruit was sold?

"3. What amount was realised by these sales?

"4. What was the profit to the Committee of Direction of Fruit Marketing accruing from these transactions?

"5. What quantity of fruit and vegetables, grown in the Stanthorpe district, was disposed of under this scheme?"

The Secretary for Agriculture (Hon. F. W. Bulcock, *Barcooo*) replied—

"1. 10,442 cases of fruit and 4,701 cases of vegetables.

"2. Fruit was distributed to 107 centres throughout the State, those taking the largest quantities being Mount Isa, Home Hill, Atherton, Cloncurry, and Cunnamulla.

"3. £3,817 19s. 3d.

"4. £53 9s. 10d.

"5. 6,787 half-bushel cases of apples; 601 half-bushel cases of grapes; 4 half-bushel cases of pears. The exact quantity of vegetables disposed of is not obtainable, but during the Stanthorpe season the bulk of vegetables distributed was grown in the Stanthorpe district."

Marketing Machinery at Fault.

"In a world containing millions of undernourished people, and where malnutrition is a prime cause of disease and suffering, Australia would be false to her trust to her own people, and to the world if she listened to talk of over production of foodstuffs and clothing materials. Such talk is utter nonsense," declared Sir David Rivett, chief executive officer of the Commonwealth Council for Scientific and Industrial Research at the Royal Show, Melbourne. Continuing, he said, that Australia should not slacken in the least her efforts to produce more efficiently more foodstuffs and to transport them more effectively. "This," he said "applies especially to all fruit, vegetables, dairy produce and meat." Although it was stated that the world did not want and would not take these things, it both needed and was suffering for the lack of them. Thought should be given to what it would mean to Australia if the European nations, America and Asia, suddenly determined that they would have no more under-nourished people within their borders. If that occurred, there would be no need to talk for generations of reducing our production, and there need be no doubt of Australia's capacity to obtain payment for goods in other countries if we were sane enough to make it easy to effect mutually advantageous exchanges.

"Admittedly, the marketing machinery is at fault," added Sir David. "Weaknesses and friction are apparent that were not observed previously. It is hampered, especially by the stupidly exaggerated nationalism which is leading some nations towards poverty when plenty is at their door, and preventing others from taking payment and buying in return for what they have to sell. As a country naturally adapted for primary production it is Australia's duty to strive its best to fit it for its job with a maximum efficiency born of sound knowledge."

Potato Growing—Importance of a Stud Seed Plot.

All main-crop potato growers should have a seed plot, and this is particularly necessary in the case of growers of ''certified'' seed potatoes. It should be remembered that there is no treatment which can make a virus-diseased tuber produce a healthy plant, and therefore normal crop yields can only be obtained by using healthy seed.

Whilst a commendable improvement has taken place in recent years where growers have regularly practised fieldroguing of diseased plants, even better results have been obtained where they have established a special stud plot. On a small area the grower can give more frequent roguings, and thus reduce the risk of current season infection. This risk is always a big one in extensive field areas, which can only be rogued at lengthy intervals.

The use of healthy seed in planting the stud plot is of supreme importance. It is not sufficient to have tubers from high-yielding plants, as some of these tubers may be carrying virus disease. Even a comparatively small proportion of diseased plants in a stud plot constitutes a danger of infection. The planting of a stud plot on the tuber unit method (planting all the sets from a tuber one after the other in the row) allows of the quicker recognition of diseased plants, and is to be preferred to the planting of cut sets in a haphazard manner.—''A. and P. Notes,'' New South Wales Department of Agriculture.

Lucerne for Grazing—Early Treatment of the Stand.

The early treatment of a stand of lucerne for grazing calls for careful attention. When the plants have reached a height of 8 or 9 inches, provided weather conditions are suitable, the stand should be fed off. This may be done with either large stock or sheep, but whichever are used the feeding must be rapid and of short duration. As many stock as possible within reason should be put on the paddock, but they should not be allowed to feed it down too close. If sheep are employed, stocking should be at the rate of eight to ten sheep per acre, in order to eat the growth off quickly. The animals should be removed as soon as the feed becomes somewhat short, otherwise they are likely to graze the lucerne too harshly and injure the young crowns of the plants.

After the first grazing the plants should be left until they are in the bud stage—that is, just prior to flowering, and the paddock should then be grazed down again. If there are insufficient stock to cope with the feeding off, the use of the mowing machine to cut the surplus must be resorted to in order to prevent waste.

Hoven or bloat is likely to occur in sheep and cattle at any time if the animals are hungry when first turned on to the paddock, and the trouble is accentuated if the lucerne is wet with rain or dew. Once sheep become accustomed to feeding regularly on lucerne, however, very few deaths occur. A mixed pasture of grasses and lucerne minimises the danger to a considerable extent, as a variety of feed is available.

Having grass paddocks to which the sheep have access adjacent to the lucerne areas will result in a better balance of feed than where only lucerne is available. This practice considerably reduces the danger of hoven, and also results in the life of the lucerne plants being extended, as the stock are not feeding on them continuously. It is the young, succulent growth of lucerne which cause most losses from hoven, and whenever possible the feed should be allowed to become more mature and reach the bud or early flowering stage before it is grazed off.

In most of the grazing districts where lucerne is available, we find, in average seasons, a plentiful growth of barley grass (*Hordeum murinum*) during winter and spring months, and some summer grasses during the remainder of the year. Such growth provides a mixture of pasturage and a well-balanced feed, and tends to reduce danger of hoven.

Four cardinal points must be observed to secure the best results from grazing lucerne:—

1. Paddocks should be subdivided, so that the size of the paddock is in correct relation to the size of the farm flock.

2. Sheep should never be allowed to feed on lucerne when it is raining and afterwards while the soil is wet, or both sheep and lucerne are liable to suffer.

3. Hungry sheep should never be turned on to lucerne, particularly if the growth is sappy.

4. If sheep are grazed for any time on lucerne alone, a dry pick is essential for the best results. Stock occasionally show symptoms of lucerne sickness when kept on it continuously.—''A and P. Notes,'' New South Wales, Department Agriculture.

Repair of Iron Tanks—Two Effective Methods.

There are two methods of repairing a galvanised corrugated iron water tank which shows signs of rusting or corroding—one is to line the inside with wire-netting and to apply over this a coating of cement mortar about an inch in thickness, and the other is to re-line it first as before with wire-netting and then with sheets of corrupated iron, leaving a 2½-inch cavity, which is filled, as the process of lining proceeds, with concrete. By the first method the life of a tank can be considerably lengthened, but the thickness of cement is not sufficient to support the contents once the iron has perished. By the second method, however, one constructs a solid concrete tank, using the iron tank as a mould, and the result is a structure which will remain in commission very many years after the original has powdered to dust.

Generally speaking, the use of tanks of not less than 2,000 gallons is advocated; such tanks, when they begin to show signs of wear, can be converted into concrete tans as described above, at a cost which will be considerably less than that of the purchase of a new iron tank. Such treatment appreciably reduces the volume of the tank, and tanks of less capacity than 2,000 gallons are scarcely worth converting in this way. Even by the first-mentioned method the cost of renovation makes its economy doubtful if the work has to be paid for at builder's labourer's rates. If the farmer does it for himself, however, or if it is done by a farm or station employee, the cost should be much less than that of the replacement of the tank.

To repair a tank by this method first brush all rust from the inside surface and tie around it on the inside wire-netting, preferably of 2-inch mesh, passing the tieing wire through small holes in the tank and twitching it up tight. Then plaster the sides through the netting with cement mortar made up of three parts clean sand and one part cement. Continue until the netting is covered, leaving a scratched or roughened surface to form a key for the next coat. In the same way put on the bottom of the tank a 1-inch thickness of the cement mortar.

When this is sufficiently set, a ⅜-inch coat of a stronger mortar (equal parts sand and cement) should be trowelled on and finished to a smooth face. Finally, a coat of wash, made of 1 lb. washing soda to 4 gallons of water, should be applied. Holes punched from the outside of the tank with a 4-inch nail are a help to the keying of the cement, and a convenience for the tie wires. The outside of the tank should be painted when the repairs are finished.

To repair a tank by the other process mentioned, remove the top by cutting close round the wall and reserve the top for the new tank. Fix wire-netting, preferably 2-inch mesh, to the wall of the tank, and secure this in position by tie wire passed through holes specially punched in the tank for the purpose.

On the bottom of the tank lay a concrete floor 1-inch thick; on top of this set wire-netting as for the walls, and then place another 1 inch of concrete, making a total thickness of 2 inches. While this concrete is still wet, take three sheets of new corrugated iron, previously curved to a diameter 5 inches less than the old tank, and secured at the laps with galvanised roof bolts set with the heads inside. Set this in position inside the tank, thus leaving a 2½-inch cavity all round. Now fill concrete in to the cavity in small quantities, and carefully tramp solid; the "water-tightness" of the tank is dependent on the thoroughness of this tamping. Having concreted the cavity to the top of the first ring, take three more sheets, fix in position, and concrete as before, and do likewise with a third set.

To enclose the tank take the top that was removed from the old tank, set it in position, and turn down the projecting edge into the wet concrete to secure the top against wind pressure. When all the cement liquid that has run through the holes in the old tank has dried, scrape reasonably clean and apply one coat of oil paint.

The materials required to line a 2,000-gallon tank will be: Nine 9 feet sheets of 26 gauge corrugated iron curved to 7 feet 10 inches diameter, 3 dozen ½-inch galvanised roof bolts, 10 yards of 72 x 2 in. x 18 gauge netting, 1 cubic yard of coarse sand, and ten bags of cement. Total cost in Brisbane £6. The concrete should be gauged one part cement to three parts sand.

It must be remembered that both these treatments, and, especially the latter, add considerably to the weight of the tank, and if necessary to make sure that the stand or supports strong enough for the purpose.

Live Stock in Queensland.

THE Registrar-General (Mr. Geo. Porter) has made available the following information concerning the number of live stock in the various pastoral districts, and in the State on 1st January, 1935, as disclosed by stock returns for that date, lodged in accordance with "The Stock Returns Act."

N.P.—For comparative purposes, the stock figures for the previous year are shown in parentheses.

Burke.—Horses, 30,548 (31,421); cattle, 568,008 (589,181); sheep, 2,595,492 (2,676,981); pigs, 1,263 (615).

Burnett.—Horses, 36,,305 (34,984); cattle, 581,404 (556,088); sheep, 4,398 (4,161); pigs, 57,835 (42,792).

Cook.—Horses, 32,524 (33,640); cattle, 497,111 (499,581); sheep, 302 (538); pigs, 8,472 (7,695).

Darling Downs.—Horses, 62,017 (61,959); cattle, 608,313 (552,706); sheep, 2,619,978 (2,543,077); pigs, 61,391 (51,331).

Gregory, North.—Horses, 10,342 (10,562); cattle, 183,521 (153,281); sheep, 1,672,909 (1,626,633); pigs, 311 (110).

Gregory, South.—Horses, 6,070 (6,139); cattle, 112,585 (107,641); sheep, 484,814 (432,215); pigs, 5 (13).

Leichhardt.—Horses, 38,562 (38,354); cattle, 742,965 (694,426); sheep, 1,077,362 (966,409); pigs, 1,609 (1,481).

Maranoa.—Horses, 20,703 (20,337); cattle, 187,422 (179,551); sheep, 3,818,971 (3,357,087); pigs, 995 (1,057).

Mitchell.—Horses, 22,137 (22,250); cattle, 76,258 (80,637); sheep, 5,611,084 (5,124,159); pigs. 422 (579).

Moreton.—Horses, 55,013 (54,956); cattle, 605,864 (590,867); sheep, 7,829 (8,372); pigs, 99,879 (81,187).

North Kennedy.—Horses, 45,208 (46,510); cattle, 502,024 (472,667); sheep, 5,586 (4,684); pigs, 4,522 (4,273).

Port Curtis.—Horses, 26,743 (26,641); cattle, 517,459 (486,273); sheep, 25,409 (27,472); pigs, 7,281 (5,907).

South Kennedy.—Horses, 23,126 (22,707); cattle, 378,663 (349,810); sheep, 257,246 (218,664); pigs, 1,410 (1,176).

Warrego.—Horses, 13,334 (13,617); cattle, 123,381 (114,813); sheep, 3,388,753 (3,077,736); pigs, 393 (435).

Wide Bay.—Horses, 25,972 (25,938); cattle, 367,663 (353,648); sheep, 4,049 (4,616); pigs, 24,085 (18,797).

	Horses.	Cattle.	Sheep.	Pigs.
Total stock on 1st January, 1935 ..	448,604	6,052,641	21,574,182	269,873
Total stock on 1st January, 1934 ..	450,024	5,781,170	20,072,804	217,448
Increase	—	271,471	1,501,378	52,425
Per cent.	—	4.70	7.48	24.11
Decreased	1,420	—	—	—
Per cent.	0.32	—	—	—

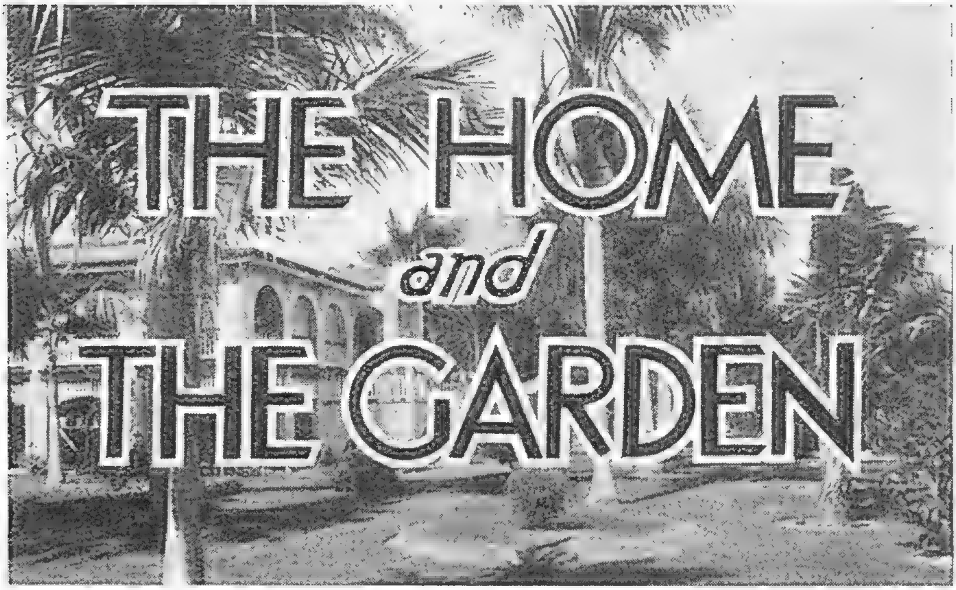
Six Maxims—

1. Teach me to be obedient to the rules of the game.
2. Teach me to distinguish between sentiment and sentimentality, admiring the one and despising the other.
3. Teach me neither to proffer nor to receive cheap praise.
4. If I am called upon to suffer, let me be like a well-bred beast that goes away to suffer in silence.
5. Teach me to win, if I may. If I may not win, then above all teach me to be a good loser.
6. Teach me neither to cry for the moon nor over spilt milk.

These maxims have been hung on the wall of the King's library and business room in Buckingham Palace.—Sir CHARLES FERGUSSON, ex-Governor-General of New Zealand.

PLATE 245.
Railway Station, Kuranda, North Queensland.

PLATE 246.
In the Jungle, near Kuranda, North Queensland.



OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE NURSING MOTHER.

To avoid becoming a weary nursing mother one must begin early. So many women in apparently good health are living on a diet that will not suffice to carry them through their period of pregnancy and nursing with a healthy body and a cheerful mind. Probably their faulty diet has become so habitual, that they are quite unconscious that any change is needed. As soon as the expectant mother has become aware of her condition, she is strongly recommended either to discuss this question of diet with her medical adviser, or to get into touch with the nearest Baby Clinic either personally or, if this is impossible, by letter.

The Diet Should Include Milk.

The advice she will get will depend somewhat on personal or local conditions, but it is not difficult to give her an outline of what she needs. The first thing she will be advised to take is good fresh cow's milk, which should be either scalded or pasteurised. In Western districts goat's milk is as good or better. It is very seldom that whole dried milk (not dried separated milk) must be substituted. Those who do not like the taste of milk may flavour it with cocoa or in some way which they prefer, or they may take it as junket, and part may be taken as custard or in a milky pudding. These may be mixed with sliced or shredded fresh fruit or stewed fruit or, failing these, with canned fruits. The quantity of milk should be one pint daily. Butter and eggs are good foods, but will not supply the place of milk. Cheese is a wholesome food. Meat should not be taken more than once a day.

Vegetables and Fruit.

Of vegetable foods what are called "greens" are the most valuable. The best is well-washed lettuce, especially if home grown. When this is not available, finely cut leaves of uncooked silver beet are a good substitute. Cooked greens such as spinach, silver beet, French beans, and cabbage take a second place, but should not be omitted. They are often so badly cooked that the best part of them is poured down the kitchen sink. The nurse will explain to you the right way to cook them.

Of the root vegetables the best is the potato, which should replace bread at the principal meal of the day. Sweet potatoes, carrots, turnips, parsnips, and Swede turnips are also valuable, if properly cooked.

Fruit should always be taken and is best uncooked. Tomatoes are the most valuable, after them oranges and pineapples, but all fruits are good in reasonable quantity. Should neither fruit nor vegetables be procurable in drought-stricken areas, eat canned tomatoes, and peas and beans that have sprouted one-half or one inch long.

The Deficiencies of White Bread.

Brown bread is better, but is not perfect. The wholemeal bread, which sustained the health of our grandmothers, is no longer procurable, and no perfect substitute for it has yet been put on the market. The best substitute available is coarse wheatmeal, which can be made into porridge and taken with a little sugar and plenty of milk. Some prefer a mixture of four parts of this with one part of oatmeal. It is best to avoid all fancy breakfast foods. Unless large quantities of this wheatmeal are taken, a heaped dessertspoonful of bemax or vita B should be taken daily, or two heaped tablespoons of cooking bran. These can be simply moistened with milk or water, or added to porridge or soup. They can also be added to milk puddings or boiled rice or made into scones.

On this diet there should be no difficulty with the bowels. If, however, the mother has contracted the harmful habit of taking opening medicines of any sort, she will need special advice, as constipation is very harmful.

The nursing mother will need besides all this to drink plenty of water, and to take a double quantity of bemax, vita B, or cooking bran.

IN THE FARM KITCHEN.

SOME QUICK LUNCH RECIPES.

Quick Tomato Soup.

Take ½ lb. onions, ½ lb. tomatoes, salt, pepper, pinch of sugar, grated cheese (if liked), dripping, 1½ pints boiling water. Cut up the onions and fry in fat for a few minutes. Plunge the tomatoes into boiling water, and after a moment remove them and peel. Slice, add to the onions, and cook for a little while. Then add boiling water and seasoning, simmer until everything is tender, put through a sieve, and serve very hot. Serve plain or with dry grated cheese.

Pot au Feu.

Take ½ lb. chuck steak, 1 onion, 2 cloves, 1 turnip, celery stalk, 1 carrot, parsley, seasoning, 1½ pints water. Put the beef into the cold water with a little salt and bring slowly to the boil. Skin well, add the sliced vegetables, parsley, and pepper, and simmer slowly for about one and a-half hours. Strain, use the soup for one course, and serve the beef hot with the accompanying vegetables, or cold with a salad.

Baked Fish Pudding.

Take ½ lb. smoked fish, ½ lb. potatoes, 1 oz. butter, breadcrumbs, pepper, and salt. Place the fish in a pan with cold water, bring to the boil, and let simmer for five to ten minutes. Boil and mash the potatoes. Remove bones and skin from the fish, flake into small pieces, and mix with the potatoes, butter, salt, and pepper. Grease a small mould or basin, line with a few browned breadcrumbs, and add the mixture. Bake for twenty minutes, turn out and serve hot with parsley sauce.

Fish en Casserole.

Take ½ lb. flathead fillet, ½ oz. butter, a little milk, salt, and pepper. Butter a small casserole dish and lay in the fillet or small pieces of fish, sprinkling each piece with salt and pepper to taste. Cover bottom of dish with milk, add butter, and cook in a moderate oven for about half-hour. Tomatoes, onions, or mushrooms may be added according to taste.

Minute Steak.

Take ½ lb. rump steak, some salad oil, seasoning, 1 oz. butter, chopped parsley. Cut steak into slices about ¼-inch thick, place on a board, and beat with a rolling-pin. Sprinkle with salt and pepper, brush over with salad oil, and grill. Serve at once with a nut of green butter on each slice, made by mixing some finely-chopped parsley into the butter, with salt and pepper to taste.

Braised Chop.

Take 1 chop, 1 carrot, 1 onion, 1 turnip, ½ teacupful stock or gravy, salt, pepper, a small piece of butter. Wash and peel the vegetables and cut into dice. Put a small piece of butter in a casserole, add vegetables, and toss for a few minutes. Place the chop on top, season well with salt and pepper, put on a close-fitting lid, and braise in the oven slowly until tender (about forty-five minutes). Add the stock or left-over gravy and serve at once in casserole.

Lemon Cream Meringue.

Take 4 tablespoonfuls caster sugar, 1 whole egg, 1 extra white, 1 tablespoonful cornflour, 1 lemon, 1 tablespoonful butter, ¾-pint boiling water. Mix cornflour and half the sugar well together in a basin. In another basin whisk the the egg and add grated rind and juice of lemon. Pour the boiling water on cornflour and sugar and stir very briskly, making a smooth liquid. Put into a pan and cook for a few minutes until transparent. Add butter, allow to cool a little, then stir in egg and lemon juice. Stand pan in another pan with a little boiling water at the bottom and cook for about five minutes. Butter a pie-dish, pour in the lemon cream, and cover with meringue made by mixing remainder of sugar with stiffly-beaten egg-white. Bake in a slow oven until a pale brown.

Stewed Victoria Pudding.

Take 4 oz. self-raising flour, 2 oz. suet, pinch of salt, ½ teacupful water, glace cherries, 1 tablespoonful apricot jam, ½ cooking apple, sugar, if liked. Mix flour and chopped suet together with a pinch of salt, grate apple, cut up cherries, and add to mixture with jam. Mix with water into a paste, put into a greased basin, and steam for one hour.

Banana Mould.

Take ½ packet pineapple jelly crystals, 2 large bananas, ½ gill cream. Dissolve crystals in gill hot water. When nearly cold, but before it has begun to set, stir in cream gradually. Peel bananas, mash with a fork, and beat until quite smooth and light. Stir this lightly and thoroughly into the jelly and cream, pour into a glass dish, and stand in a cool place to set. If the mixing is done before the jelly is sufficiently cool, the jelly, banana, and cream will separate into layers.

Rice Bavaroise.

Take ¼ cup rice, 1 egg-white, 2 cups milk, ¾ cup sugar, 1 dessertspoonful gelatine, 2 tablespoonfuls cold water, a few drops of vanilla essence. Wash rice and cook with salt, sugar, and milk until soft and thick, stirring frequently. Soak gelatine in cold water and stir into rice mixture. When nearly set fold in stiffly-beaten egg-white, add vanilla essence, and set in a small mould. Serve with sieved fruit.

Fried Bacon and Banana.

Take 1 banana, 2 thin slices bacon, toast. Peel the banana, and cut into slices. Take some thinly-sliced bacon and fry in a pan until crisp. Put to one side and fry the slices of bananas in the bacon fat. Serve very hot on pieces of crisp dry toast.

Kedgeree.

Take 4 oz. cooked fish, 2 oz. rice, 1 hard-boiled egg, 1 oz. butter, salt, pepper. (The remains of any steamed or boiled fish may be used for this dish.) Cook rice in fast-boiling water for 20 minutes, then drain. Flake fish into small pieces, put butter in a small saucepan, and, when melted, add rice, fish, chopped egg-white, salt, and pepper. Stir until quite hot, and serve garnished with sieved egg-yolk.

FOR THE VEGETARIAN MENU.

Cheese and Lentil Rolls.

Take ½ lb. rough puff pastry, 1 cupful lentils, 2 tomatoes, 2 oz. cheese, 1 cupful breadcrumbs, 1 oz. butter, salt, pepper, mustard, beaten egg.

Wash the lentils, then tie them loosely in a cloth. Cook for an hour in boiling salted water, then rub through a wire sieve. Add the butter, the skinned and sliced tomatoes, and grated cheese, and enough breadcrumbs to thicken. Roll the pastry into a thin strip, cut it into squares, brush it with beaten egg, and place on the centre of each square a roll of the lentil mixture. Fold the pastry over, trim the edges, brush with beaten egg, and bake for twenty minutes.

Macaroni and Tomatoes.

Take 4 oz. macaroni, 3 tomatoes, 1 oz. butter, 2 tablespoonfuls flour, salt, pepper.

Break the macaroni into short lengths and put into rapidily-boiling water and cook for twenty minutes. Prepare some tomato puree by boiling the tomatos and rubbing them through a sieve. Then melt the butter in a pan, add the flour, and pour in the puree. Add salt and pepper to taste. Allow to boil for a few minutes, then add the well-drained macaroni. When the whole mixture is thoroughly hot, turn into a dish and serve.

Macaroni Cheese.

Take 4 oz. macaroni 5 oz. grated cheese, ¾ pint white sauce, salt, cayenne pepper, a few dabs of butter.

Break the macaroni into fairly small pieces, put them into boiling salted water, and boil for about twenty minutes, then drain. Cover the bottom of a well-greased fireproof dish with white sauce, sprinkle with cheese, and add a layer of macaroni. Season with cayenne pepper. Continue adding macaroni, covering each layer with sauce and sprinkling of cheese. Cover the last layer of macaroni thickly with sauce and a good sprinkling of cheese. Place a few dabs of butter on top and bake in a quick oven until the cheese is nicely browned. Serve in the dish in which it is cooked.

Savoury Carrot Pudding.

Take 1 lb. carrots, half their bulk in breadcrumbs, 2 oz. butter, 1 egg, pepper, salt, Hollandaise sauce.

Scrub the carrots and scrape them, put them into boiling water and cook until soft. Rub them through a sieve. Add the breadcrumbs and butter, with seasoning to taste, and sufficient beaten egg to bind well together. Butter a basin, put in the mixture, and steam for three-quarters of an hour. Turn out the pudding and serve hot with the sauce poured round.

Nut Rissoles.

Take ½ lb. shelled nuts, ½ lb. cooked potato, mixed herbs, cayenne pepper, salt, a little milk, flour, butter.

Pound the nuts well. Take a sufficient quantity of cooked potato to bind the mixture. Add the chopped herbs and season with cayenne pepper and salt to taste. Form into small rissoles, brush over with a little milk, and dredge with flour. Fry in butter. Serve hot on a bed of spinach, or cold with lettuce salad.

Nut Roast.

Take 1 cupful brown breadcrumbs, 1 cupful shelled Barcelona nuts, 2 eggs, 1 oz. butter, 2 tomatoes, 1 cupful white breadcrumbs, 1 onion, salt and pepper to taste.

Melt the butter, and add the chopped onion and the skinned and sliced tomatoes, and fry. Add the breadcrumbs and nuts, finely chopped. Moisten with the beaten eggs. Season with salt and pepper. Press the mixture into a greased pie-dish and bake half an hour. Turn out and serve with apple sauce.

Vegetable Charlotte.

Take 3 large carrots, 6 large potatoes, 3 eggs, ¼ cupful flour, 1 teaspoonful castor sugar, 2 teaspoonfuls salt.

Peel and grate the potatoes. Stir in the salt, pepper, and slightly-beaten eggs. Grate and part-boil the carrots in water and cover with the sugar when they are nearly tender. Drain off the water and stir in the potato mixture, flour, and seasoning to taste. Turn into a well-buttered fireproof dish and bake very slowly till a golden brown. For a more elaborate dish this mixture can be baked in a border mould, and the centre can be filled, when turned out, with buttered peas or fried mushrooms.

HOW TO MAKE SOAP.

Materials.

6 lb. clean dripping; 2 gallons water; 1 lb. caustic soda; ½ lb. resin; 3 tablespoons borax or kerosene.

Method.

1. Put dripping, resin, and water into a boiler or kerosene tin.
2. Boil until all fat is melted—15 to 30 minutes.
3. Add borax or kerosene; remove from fire.
4. Add caustic soda direct from the tin gradually, allowing bubbles to subside between each addition.
5. Boil gently for one or two hours.
6. Pour into a box lined with a damp cloth.
7. When solid, cut into bars and store in a dry place until hardened.

RAILING PIGS—HOW TO REDUCE FREIGHTS.

One of the problems to be faced by bacon factories and meatworks, especially those operating on a small scale, is the cost of transit per rail of pork and bacon pigs. Rail freights, while not excessive, are not based on the actual cost per pig, but on the cost per wagon, whether the space occupied is classed as a quarter deck, half-deck, single deck, or full truck.

This matter was ventilated in North Queensland recently, when the North Queensland Co-operative Bacon Association, of Mareeba, drew attention to the increased freight rates charged on pig wagons dispatched from country sidings. Pig growers, they point out, should load the bottom deck of pig wagons to maximum capacity before placing any pigs on the top deck, for if both decks are used full truck rates will be charged, whereas if only one deck is occupied, and space for such is ordered, only half truck rates will apply.

The association instanced a case where the factory ordered one tier or deck of a pig wagon, and provision was made for loading up to twenty-five bacon pigs at a freight charge for a half-wagon, which, for the distance covered, totalled £1 4s. Eighteen pigs were loaded by the farmers, some being placed on the top deck, and some on the bottom deck. This resulted in the factory being charged full truck rates of £2 8s., whereas the number of pigs dispatched was less than that required for one deck only. It is in matters like this that farmers and trucking agents can do much to assist in reducing manufacturing costs.—E. J. SHELTON, Senior Instructor in Pig Raising.

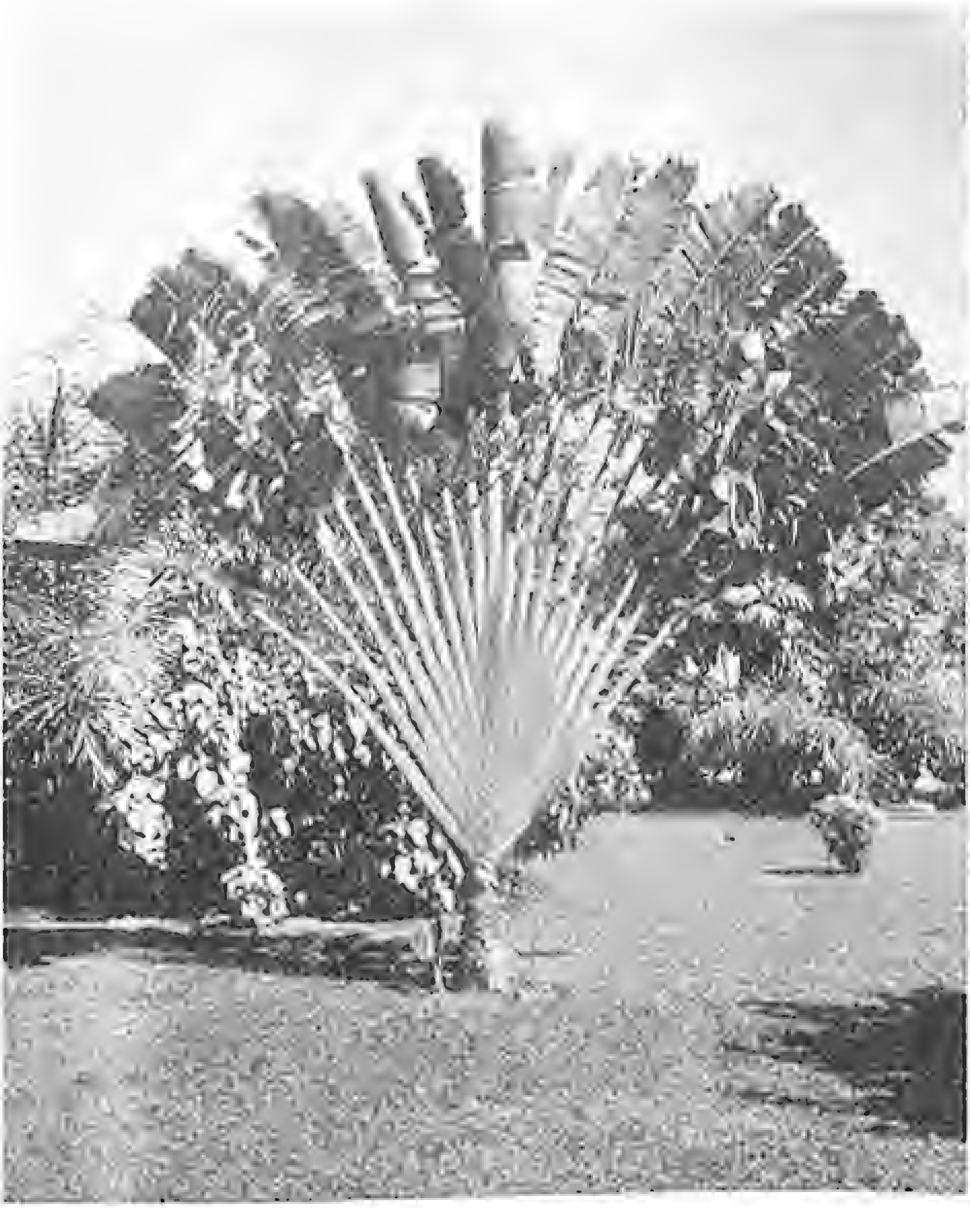


PLATE 247.
THE TRAVELLER'S PALM.—A Corner of a Northern Garden.

Orchard Notes for December.

THE COASTAL DISTRICTS.

THE planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilse small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying for scale insects should be carried out where necessary. Spraying with fungicides should have already been carried out where necessary, and except in the case of a heavy infestation with black spot or brown spot of the Emperor mandarin, no further applications of copper sprays should be required. A close lookout must be kept, for the first indications of ''maori,'' and as soon as it is discovered the trees should either be dusted with sulphur or sprayed with lime sulphur. Borer should be looked for and destroyed wherever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and lemons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Look out for Irish blight in potatoes and tomatoes, and downy and powdery mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for Irish blight and downy mildew and sulphur dust or lime sulphur spray for powdery mildew.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, ''Early ripe, early rotten,'' applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled and packed with great care, and nothing but choice fruit sent

to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripenng fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot of downy mildew or sulphured for oidium.

Farm Notes for December.

ALTHOUGH November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in distrcts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of ensilage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localites where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as a fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state; consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

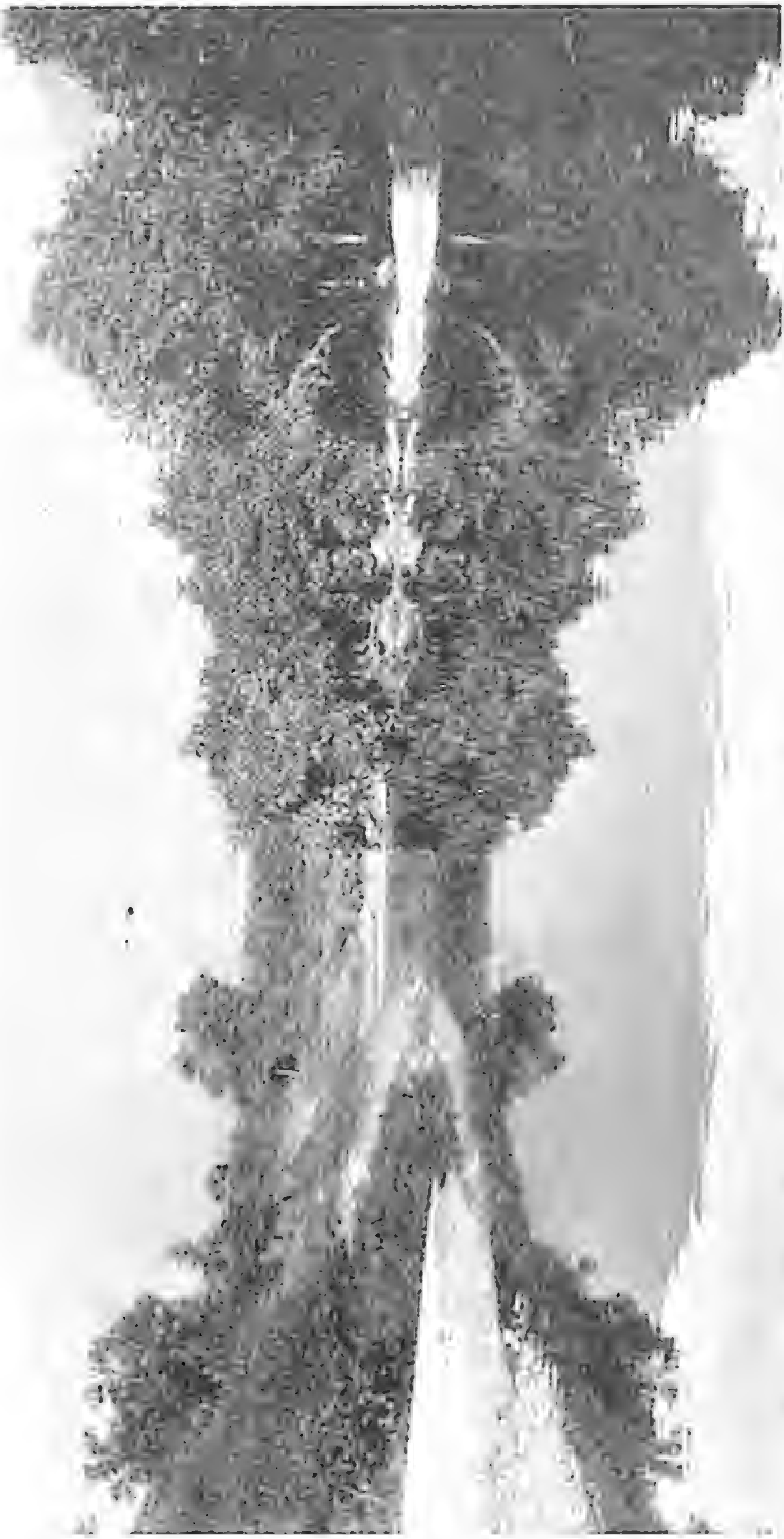


PLATE 23[illegible].

The Little Mulgrave River, near Gordonvale, North Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.,	No. of Years' Records.	Sept., 1935.	Sept., 1934.
North Coast.	In.		In.	In.
Atherton	0·71	34	..	2·33
Cairns	1·67	53	0·08	2·23
Cardwell	1·54	63	0·28	1·92
Cooktown	0·58	59	..	0·62
Herberton	0·56	49	0·03	2·46
Ingham	1·58	43	0·15	1·61
Innisfail	3·53	54	0·20	5·48
Mossman Mill ..	1·57	22	0·02	1·67
Townsville	0·80	64	0·03	0·18
Central Coast.				
Ayr	1·39	48	0·17	0·15
Bowen	0·82	64	0·68	0·67
Charters Towers ..	0·83	53	0·47	0·02
Mackay	1·56	64	2·70	0·98
Proserpine	2·14	32	0·79	1·18
St. Lawrence ..	1·20	64	1·00	0·92
South Coast.				
Biggenden	1·54	36	3·38	0·95
Bundaberg	1·59	52	2·49	0·74
Brisbane	2·02	84	3·49	6·33
Caboolture	1·86	48	3·07	0·37
Childers	1·83	40	2·93	0·71
Crohamhurst ..	2·70	42	3·81	1·04
Esk	2·11	48	4·18	0·94
Gayndah	1·59	64	2·01	2·06
Gympie	2·12	65	4·10	0·42
Kilkivan	1·71	56	2·64	1·03
Maryborough ..	1·96	64	3·33	1·16
Nambour	2·54	39	4·08	0·96
Nanango	1·84	53	2·64	0·80
Rockhampton ..	1·83	64	1·42	0·30
Woodford	2·20	48	2·88	0·55

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.,	No. of Years' Records.	Sept., 1935.	Sept., 1934.
Central Highlands.	In.		In.	In.
Clermont	1·04	64	0·61	0·18
Gindie	1·10	36	..	0·06
Springsure ..	1·30	66	3·00	0·36
Darling Downs.				
Dalby	1·68	65	3·06	0·80
Emu Vale	1·76	39	2·80	1·67
Hermitage	1·55	29	..	1·71
Jimbour	1·48	47	2·40	0·69
Miles	1·34	50	2·97	0·52
Stanthorpe	2·29	62	4·16	2·93
Toowoomba ..	2·13	63	3·36	0·91
Warwick	1·82	70	3·19	1·16
Maranoa.				
Roma	1·42	61	2·84	0·12
State Farms, &c.				
Bungeworgorai ..	0·97	21	..	0·11
Gatton College ..	1·55	36	2·99	0·77
Kairi	0·68	21	..	1·68
Mackay Sugar Experiment Station	1·48	38	3·94	1·06

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·4	82	67	85	18	61	28	Nil	..
Herberton	..	78	55	86	18	47	22	3	1
Rockhampton	30·04	81	58	90	15	48	19	142	7
Brisbane	29·96	74	55	82	15	46	7	349	8
Darling Downs.									
Dalby	30·04	73	46	87	16	32	6	306	10
Stanthorpe	..	65	39	77	16	20	6	416	9
Toowoomba	..	68	47	86	16	38	2, 19	336	8
Mid-Interior.									
Georgetown	29·93	91	62	97	16	50	21	Nil	..
Longreach	29·98	85	53	94	16	42	22	83	4
Mitchell	30·04	74	46	82	16	36	3, 6, 23	206	7
Western.									
Burketown	29·93	90	66	98	17	57	19	Nil	..
Boulia	29·97	84	57	95	15	47	19, 20	91	4
Thargomindah	30·01	73	51	84	30	41	5	168	4

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November. 1935.		December. 1935.		MOONRISE. Nov., 1935.	MOONRISE. Dec., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·3	6·9	4·49	6·32	8·18	9·19
2	5·2	6·10	4·49	6·33	9·16	10·20
3	5·2	6·10	4·49	6·34	10·19	11·24
						p.m.
4	5·1	6·11	4·49	6·34	11·23	12·26
					p.m.	
5	5·0	6·12	4·49	6·35	12·28	1·29
6	4·59	6·12	4·49	6·36	1·32	2·35
7	4·59	6·13	4·50	6·36	2·35	3·41
8	4·58	6·14	4·50	6·37	3·41	4·49
9	4·58	6·15	4·50	6·38	4·50	5·52
10	4·57	6·16	4·50	6·38	6·1	6·54
11	4·57	6·17	4·50	6·39	7·7	7·48
12	4·56	6·17	4·51	6·39	8·10	8·38
13	4·55	6·18	4·51	6·40	9·10	9·20
14	4·54	6·19	4·51	6·41	10·1	9·55
15	4·53	6·20	4·51	6·41	10·46	10·27
16	4·53	6·21	4·52	6·42	11·25	10·58
					a.m.	
17	4·53	6·21	4·52	6·43	12·0	11·27
18	4·52	6·22	4·52	6·43		11·56
19	4·52	6·22	4·53	6·44	12·30	a.m.
20	4·52	6·23	4·53	6·44	12·58	12·28
21	4·51	6·23	4·53	6·45	1·29	1·1
22	4·51	6·24	4·54	6·46	1·57	1·37
23	4·51	6·25	4·54	6·46	2·30	2·17
24	4·50	6·26	4·55	6·47	3·4	3·6
25	4·50	6·26	4·55	6·47	3·41	4·0
26	4·50	6·27	4·56	6·48	4·26	5·1
27	4·50	6·28	4·56	6·48	5·16	6·3
28	4·49	6·29	4·57	6·49	6·12	7·9
29	4·49	6·30	4·58	6·49	7·13	8·14
30	4·49	6·31	4·59	6·50	8·5	9·17
31			5·0	6·50		10·21

Phases of the Moon, Occultations, &c.

4 Nov.,	☾	First Quarter	9 12 a.m.
11 ,,	○	Full Moon	12 42 a.m.
18 ,,	☽	Last Quarter	10 36 a.m.
26 ,,	●	New Moon	12 36 p.m.

Perigee, 8th November, at 8.48 p.m.
Apogee, 20th November, at 4.0 p.m.

On the 1st November between 12 and 1 o'clock in the middle of the day, the Moon will be passing from west to east of Mars, causing an occultation of that planet which will be visible in Queensland only at places north of Townsville. A telescope or binoculars will be required to observe this phenomenon in broad daylight; but a very interesting spectacle will be afforded by the crescent Moon and the planet wherever the sky is sufficiently clear near the zenith of Bundaberg.

On the 2nd Mercury will be in a fairly favourable position for observation in the early morning, being 19 degrees west of the Sun and rising 49 minutes before it, the Moon being far below the hoziron.

On the 18th Venus will be at its greatest distance, 47 degrees, west of the Sun, rising at 2.32 a.m. almost due east (only 2 degrees south). Its brightness will be much less than on 18th October, when it reached its maximum, the diminution being in the proportion of almost 3 to 4. Early risers will, however, find Venus a magnificent object, apparently in the constellation Virgo, about twice the length of the Cross north-westward of Spica. The Moon, with about half its face illuminated, will be much further westward, not far from the Meridian at 4 a.m. on the 19th.

The giant planet Jupiter, which was visible all night in May, will disappear entirely near the end of November, when it will rise and set almost at the same time as the Sun.

Mercury rises 4.14 a.m., 49 minutes before the Sun on the 1st; on the 15th it rises at 4.11 a.m., 42 minutes before the Sun.

Venus rises 2.49 a.m. and sets 2.43 p.m. on the 1st; on the 15th it rises at 2.34 a.m. and sets at 2.45 p.m.

Mars sets at 10.23 p.m. on the 1st and at 10.13 p.m. on 15th.

Jupiter rises at 6.16 a.m. and sets at 7.44 p.m. on the 1st; on the 15th it rises at 5.30 a.m. and sets at 7.3 p.m.

Saturn rises at 1.11 p.m. and sets at 2.9 a.m. on the 1st; on the 15th it rises at 12.14 p.m. and sets at 1.15 a.m.

The Cross will not come into view till about 10.30 p.m. at Brisbane, and at nearly 11 p.m. at Townsville on 1st November, and one hour earlier on the 15th.

3 Dec.	☾	First Quarter	5 28 p.m.
10 ,,	○	Full Moon	1 10 p.m.
18 ,,	☽	Last Quarter	7 57 a.m.
26 ,,	●	New Moon	3 49 p.m.

Perigee, 26th December, at 8.6 a.m.
Apogee, 18th December, at 12.42 p.m.
Perigee, 31st December, at 1·24 a.m.

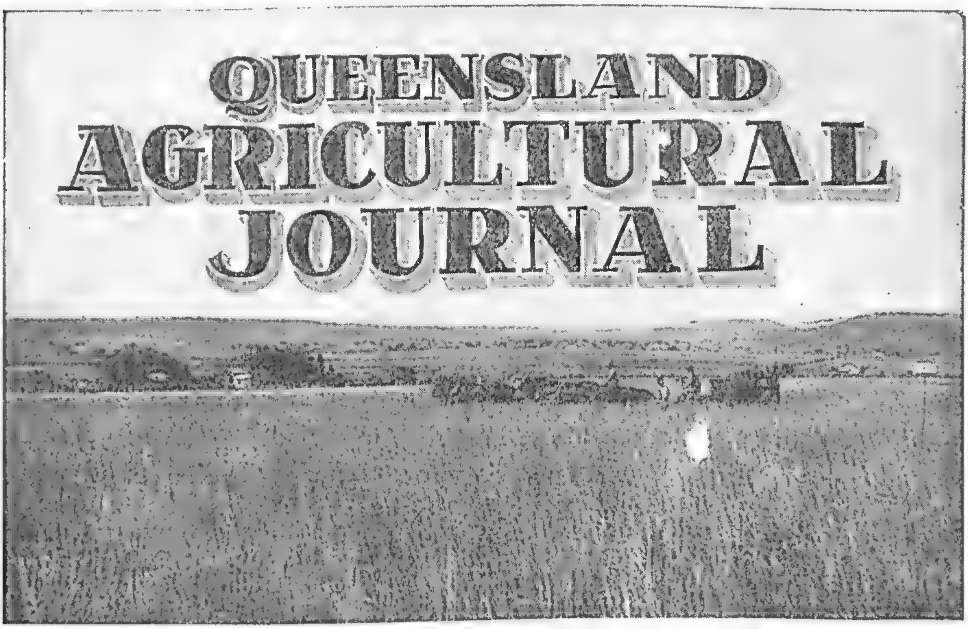
For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten shillings,** including postage.



VOL. XLIV. 1 DECEMBER, 1935. PART 6

Event and Comment.

The Queensland Butter Board—Marketing Efficiency the Aim.

AN alteration in the method of electing the Butter Board aroused considerable controversy in the course of the month, much of it expressed in print in the correspondence columns of the metropolitan Press. In making a general reply to this criticism, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, dealt effectively with the objections made to the amended method of election. He pointed out that the Butter Board is only indirectly the selling instrument for the producer, but is the direct agent for the factory. The merit of such an arrangement lies in the fact that under this system the Butter Board is under a definite control, and should circumstances so warrant it, definite action could be taken by the factories—whose representatives meet each year in conference—such as is not possible by the producers.

The producers trust their directors; the great co-operative movement has been built on such trust and faith, and now for various reasons, said Mr. Bulcock, certain people are saying the directors are not worthy of trust and should not be given the power to elect the board.

"Efficiency is the keynote of progress, and if I understand the producer aright he is anxious to get the maximum of efficiency. A board elected by those who have a knowledge of butter marketing with all its difficulties and problems is surely likely to function more satisfactorily than a board chosen by producers, many of whom are unable to devote time to a study of the problem of butter marketing"

The proposed system builds up organisation in logical sequence. Under it the board is responsible to the factories, and the factories are responsible to the producers. But the problems confronting the factories are essentially different from the matters which concern the Butter Board, and the new system fairly divides responsibility, but places it on the shoulders of those who should carry it.

The method adopted for the forthcoming Butter Board election is on all fours with the present Federal system for election to that much more important body—the Federal Export Board—and is the system followed by the Hamilton Cold Stores Federation. In addition, the Sugar Board and the Committee of Direction of Fruit Marketing are elected in a similar fashion.

"It is significant," Mr. Bulcock added, "that no protest was raised when the Federal system was introduced, nor was a voice raised when the system to which I am now reverting was in operation years ago.

It is further to be remarked that no protest has reached me from interested parties, for since the Order was gazetted I have received no hostile communication in relation to the proposals."

Much has been said about depriving the farmer of his vote. The following figures indicate just how much this argument is worth:—

1926 ELECTION.

Division.	No. of suppliers.	No. who voted.	Votes cast for elected rep.	P.C. votes recd. to suppliers in div.	P.C. votes recd. of total suppliers.
1	2,442	1,137	590	24	3.2
2	3,588	1,869	838	23	4.5
3	3,582	1,786	1,174	32	6.4
4	4,476	2,413	1,540	34	8.4
5	4,134	1,647	916	22	5.0
	18,222				

1928 ELECTION.

1	583	281	187	32	1.0
6	4,446	1,833	1,238	27	6.8

Total suppliers, approximately 18,000.
(No election 2, 3, 4, and 5 districts.)

1931 ELECTION.

1	737	379	304	41	1.6
3	4,093	2,767	1,391	34	7.7
4	3,572	2,492	1,445	40	8.0

Total suppliers, approximately 18,000.
(No election in 2, 5, and 6 divisions.)

These figures alone, apart from any other consideration, fairly justify the contemplated change.

Are Farmers to Blame?

ALTHOUGH the world's oldest industry, agriculture is often regarded with indifference, many city dwellers are quite forgetful of the fact that without the farmer their comparatively easy economic position would not be possible. In fact, the less intelligent among them affect a sort of social superiority over the tiller of the soil, who in their small minds is more or less deficient in all those qualities of business acumen

and brain of which they—the complacent city people—believe themselves to possess a monopoly. To that type of town mind the farmer is just the "Dad," "Dave," and "Joe" of the weekly comic Press, or that gross caricature which is the perennial butt of shallow city journalism. This remarkable mentality manifested itself at a recent meeting of a public body in another State, at which one speaker referred rather contemptuously to some local farmers as just ill-informed "cockies." There were protests, of course, and farmers present expressed resentment against the offensive personal reference. But the question arises, are not farmers themselves often to blame for depreciatory remarks about themselves and their calling?

In fact, is it not quite common at country meetings for farmers to call themselves "cockies" and describe their own vocation as "cockying?" Even in Press communications many a good letter is spoilt by the pen-name adopted in a spirit of flippancy by the writer—"Cow Cocky," "Cane Cocky," "Poddy Dodger," and similar self-depreciatory pseudonyms. The world too often takes us at our own valuation, and self-depreciation never gets us anywhere.

In his contact with the world in general, in his contribution to the wellbeing of humanity, in his share in commercial and industrial enterprise, in his place in the realms of literary, artistic, and scientific achievement, and as a citizen of the Commonwealth, there is no warrant for the Australian placing himself under the influence of or developing what is called, in the jargon of the day, an inferiority complex. Australians have demonstrated their character and capacity in every field of human endeavour, both in peace and in war; they have shown themselves in no way inferior to other peoples either in intelligence or attainment. On the contrary, possessing as they do all the positive characteristics of the composite British peoples, the elements of the Australian race, they have very many points decidedly in their favour —and that may be said without overweening conceit and only on the evidence of the facts. While all this may be fairly claimed of Australians in general, the same may be said of farmers, as a class, in particular. When leaders were wanted in the A.I.F., boys from the bush supplied the demand. In the field of invention and in every avenue of peaceful enterprise, urban or rural, the land has supplied more than a fair share of the brains and brawn that established great undertakings, backed them, and led or forced them through to complete success.

The thoughtless jibe which we have taken as our text would naturally rankle in the minds of those to whom the remark was applied, but again it is asked are not farmers in some measure themselves responsible? What real protest have they ever made against the continual caricaturing of themselves in cheap city prints by artists whose conception of the farmer—the national food provider and economic shock absorber—is of the "Dad and Dave" order? Why do they call themselves, or allow themselves to be called, "cockies"? In the last generation the stage "Irishman" was an inhabitant of every music hall—a standing insult to a great race of people. Through vigorous objection, that grotesque travesty was banished from places of amusement never to return. Why do farmers endure without effective protest, even though some of their number unconsciously or thoughtlessly encourage it, the continual, humiliating caricaturing of themselves and their calling—one of the greatest and noblest to which man may set his hand and brain.

Potato Tuber Moth and Its Control.*

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

THE tuber moth, which is the world's most serious pest of potatoes, occurs wherever they are grown in Queensland. It is also a notorious enemy of tobacco, being known to growers of that crop as the tobacco-leaf miner, but the present discussion will be confined to the insect's activities as an enemy of the potato.

Life History and Habits.

The minute, oval, white, iridescent eggs (Plate 249; fig. 1) are deposited on leaves, stalks, and tubers, and may even be found on the sacks containing infested potatoes. The eggs on the tubers are laid in batches at the eyes (Plate 249; fig. 2) or in surface scars, but on the leaves they occur singly, and usually on the under surface, a total of 200 eggs being laid over a period of about two weeks by a single moth. The incubation period varies greatly, larvæ emerging from eggs laid in mid-summer in three to five days, while in midwinter in North America an incubation period of almost five weeks has been recorded. The larvæ on hatching commence tunnelling within the leaf if the eggs have been laid thereon, and destruction of the tissue between the upper and lower surfaces can soon be detected in the form of blotch mines. Larvæ hatching on the tubers (Plate 249; fig. 8) either tunnel under the skin thereof or work their way to the heart of the potato. The tunnels may be 2 or 3 inches in length, and obviously burrowing in the heart of the tuber (Plate 249; fig. 9) is the most serious form of attack, large consignments of potatoes being frequently ruined thereby. The larvæ (Plate 249; fig. 3) are full-grown at the end of two weeks in summer, and then measure ½ inch in length and are predominantly white in colour with a slightly pinkish or greenish tinge on the upper surface. They generally pupate in silken cocoons (Plate 249; fig. 4) on the outside of the tubers, in folds of sacking, among dead leaves or under lumps of soil. Occasionally, however, the dark-brown pupæ (Plate 249; figs. 5 and 6), which are one-third of an inch in length, occur at the entrances of the tunnels in the tubers. Although silk is used in weaving the cocoons, any parts thereof that would otherwise be exposed are covered by particles of earth or debris; hence the silken nature of the cocoons is obscured. Eventually the inconspicuous moths (Plate 249; fig. 7) emerge after a pupal period of about one week during the warmer weather, and are seen to be greyish-brown in colour with a wingspread of half to three-quarters of an inch. Quite a number of generations of this pest are produced in the course of the year.

Control.

The first step in the control of the potato tuber moth is the safe-guarding of the tubers in the soil. The seed potatoes should therefore be planted as deeply as practicable, the plants should be well hilled up, and the surface soil thoroughly pulverised. The procedure just outlined materially assists in reducing infestation of the tubers during the growing period, as it minimises the chances of the pest gaining access to them. At harvesting, the potatoes should be bagged, and the bags sewn up and removed from the field as soon as possible. The potatoes should never be exposed overnight in the field, for if that is done thousands of eggs

* *Phthorimæa operculella* Zell.

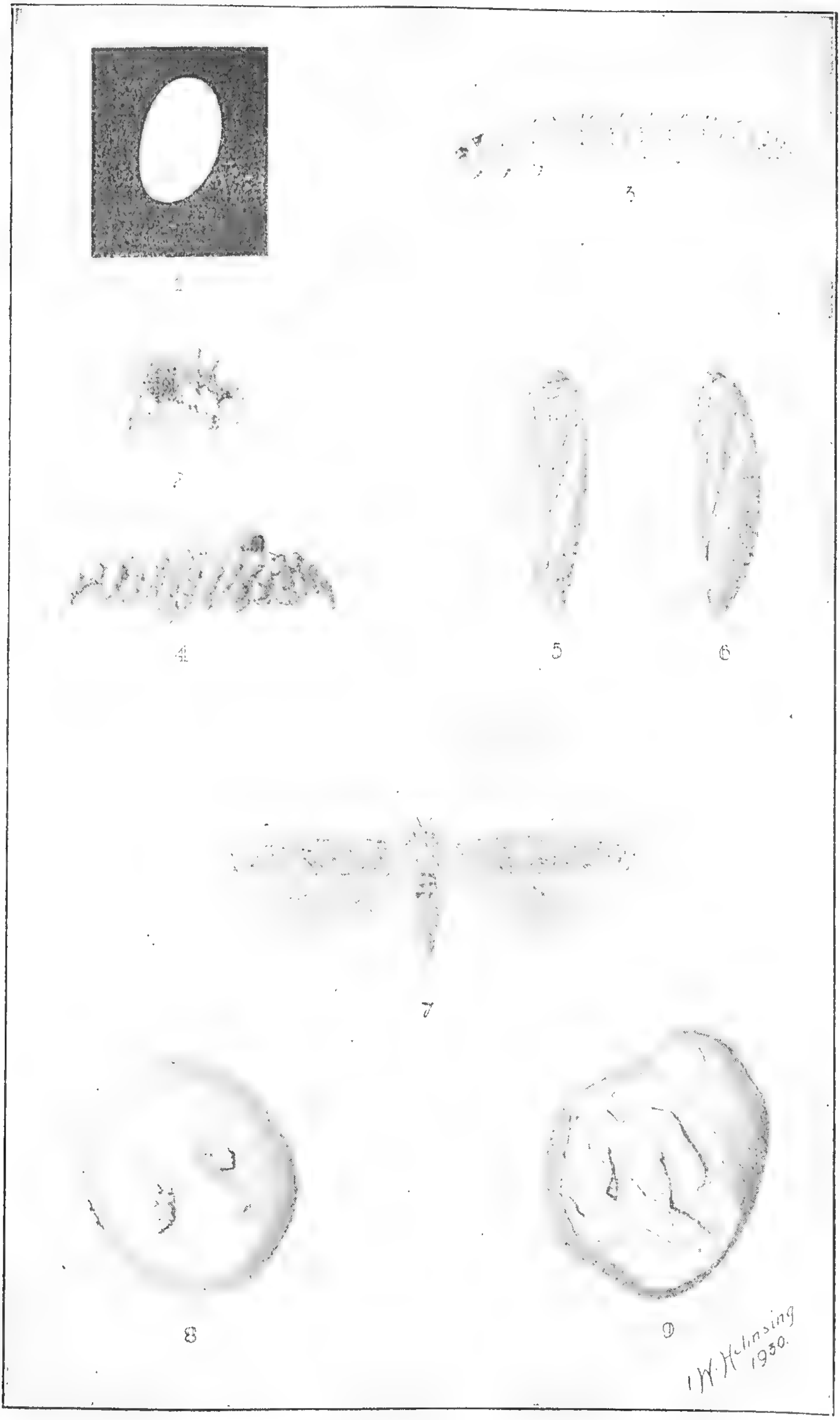


Plate 249.

Potato tuber moth. Fig. 1: Egg × 35. Fig. 2: Eggs on tuber surface × 10. Fig. 3: Larva, lateral view × 4. Fig. 4: Silken cocoon covered by particles of earth × $2\frac{1}{2}$. Fig. 5: Pupa, ventral view × 7. Fig. 6: Pupa, lateral view × 7. Fig. 7: Adult × 4. Fig. 8: Tuber showing external signs of infestation, half natural size. Fig. 9: Tuber showing tunnelling, half natural size.

will be laid on the tubers and severe infestation will inevitably eventuate during storage. Furthermore, the potatoes should never be covered with the tops, as these are frequently heavily infested with the larvae of the moth, which speedily migrate to the potatoes from the fast-withering foliage and stalks. The tubers should preferably be placed in new bags, but if the containers have been previously used for the storage of potatoes they should be immersed in boiling water to ensure the destruction of any potato tuber moth larvæ, pupæ, or eggs which they may be harbouring. Whenever it is practicable to do so, the tubers should be placed in a store to which the moth cannot readily gain access. Finally, in cases where infestation has occurred carbon bisulphide fumigation at the rate of 2 lb. of the fumigant to 1,000 cubic feet of the container will be found to be productive of beneficial results. The fumigation, the duration of which should be forty-eight hours, may require repetition should reinfestation occur. Fumigation at the strength indicated will kill the moths and larvæ and will dispose of most of the eggs and pupæ.

CROWBAR STRAINER.

A crowbar can be used as a makeshift strainer. Take a turn or two with the wire round the bar, and then back on to itself again. The point of the bar is driven

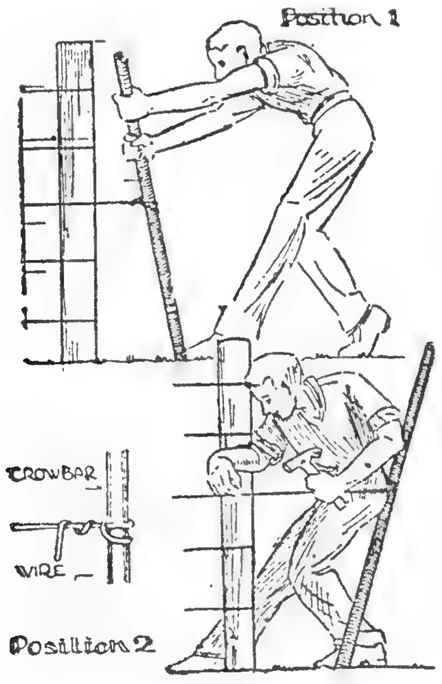


PLATE 250.

into the ground. With plain wire the staple may be in place, and then when the bar is levered back, it is an easy matter to sit on the bar and drive the staple home. With barbed wire, a sack used on the wire at the bar will save the fencer from being pricked.—"The Canegrowers' Weekly" (Mackay).

Coccidiosis of Poultry.

By C. R. MULHEARN, B.V.Sc., Veterinary Surgeon, Animal Health Station, Yeerongpilly.

COCCIDIOSIS is a disease caused by protozoan parasites known as coccidia. The parasites are very minute in size and can only be seen by aid of the microscope. There are many closely related types affecting both animals and birds, but each, with few exceptions, is specific for its own individual host—i.e., the parasites of one type of host are incapable of producing the disease in another.

Six different species of coccidia are known to infect the fowl. This, to a large extent, accounts for the diversity of symptoms and post-mortem appearances seen in this group of diseases. The two more common forms are located in the intestine and the caecum (blind gut), and both may be responsible for heavy mortalities in young chickens. Occasionally the disease is seen in turkeys, but ducks are rarely affected. The life cycles of all species are very similar, and consequently control measures are the same for each.

Heaviest mortality is experienced in young birds in which the acute form of the disease is encountered. The chronic disease is mostly seen in older birds, but it is of utmost importance, for not only does it cause much loss to the poultry farmer, but the infested adult birds act as a continual source of infection to the young stock.

The disease has come greatly into prominence with the artificial means of incubation and brooding. The unnatural methods of housing a large number of young birds in a confined area and under conditions which are essentially suitable for the propagation of the parasites greatly facilitates the spread of the disease through a flock.

Nature of the Disease.

The intestinal tract is the principal seat of the disease in all the domesticated birds. The kidneys may also be infected in the goose. The lesions are found in various portions of the intestines according to the species of coccidia concerned.

Life Cycle of the Parasites.

The coccidia are one host parasites—i.e., the infective material on passing from one fowl produces an attack of the disease when swallowed by another fowl. This is an important factor, and it has to be taken into consideration when control measures are adopted. The infective material which is in the form of minute cysts is passed out in the droppings of the diseased bird. These cysts require suitable conditions of moisture and humidity before they can ripen or effect the necessary changes within themselves, so that they can produce further cases of the disease. Under favourable conditions the ripening process may be completed within two days, but under other conditions fourteen days may be required. The cysts are covered with a tough leathery membrane and, being highly resistant, they remain infective for a considerable period of time. When they are picked up by their appropriate host, the membrane is dissolved by the digestive juices and a number of parasites is liberated in the intestinal tract. Each of these parasites invade a cell lining the wall of the intestine, and after growing it divides up into a number of new parasites which destroy the cell and become

liberated in the intestine. Each new parasite seeks a fresh intestinal cell, and this process is continually repeated. This is known as the asexual reproduction, and it is responsible for considerable damage and bleeding in the intestines. As a result the normal functions are interfered with, so that the birds are unable to gain full benefit from their food. Further, the breaking down of the tissues produces poisons which, when absorbed, seriously affect the general wellbeing of the fowl.

In order that the coccidia may not die out with the host bird, nature has evolved another method of reproduction whereby male and female parasites unite to form a spore-like body or cyst. This cyst is then covered with a tough envelope and is passed out in the droppings to the exterior. When a large number of cysts are passed out and the droppings are not regularly cleaned up, the houses and the feed and water become grossly contaminated. Healthy chickens introduced into such houses are exposed to heavy infestation and develop a serious form of the disease. It is obvious, then, that where the chickens are closely confined and when bad sanitation is practised, conditions are favourable for a rapid spread of coccidiosis from bird to bird. On the other hand, with good sanitation the losses will be minimised.

Incidence of the Disease.

The disease is widely distributed, and each year it is responsible for heavy losses amongst young birds in southern Queensland. Young chickens a week old may occasionally be infected, but most losses occur in birds aged from two to ten weeks. It is generally when chickens are moved from the brooders to infected runs that outbreaks are encountered. Adult fowls may also be infected, but they usually suffer from the chronic type of coccidiosis.

Symptoms.

Chickens usually suffer from the acute form of the disease, although some may also show symptoms of the chronic form. The severity of the symptoms is dependent to a large extent on the degree of infestation, and this is directly related to the methods of sanitation adopted.

In the very severe cases no symptoms may be noticed, for an individual chicken may appear normal one day and be found dead the next. In the more common cases the affected chickens lose their appetite and become listless and depressed. They show evidence of general mopiness and stand hunched up with ruffled feathers and drooping wings. There is usually a greyish-white or mustard-coloured diarrhœa, and in severe cases blood may be present in the droppings. The above symptoms, however, are not diagnostic of coccidiosis, for they may be seen in other diseases of chickens. The affected birds usually show some evidence of anæmia, and the comb and wattles become very pale. Leg weakness and even paralysis may develop in some cases, but it must not be assumed that all cases of leg weakness are due to coccidiosis.

In fatal cases, death usually takes places in from two to seven days after the onset of symptoms. Chickens which are strong and vigorous are not so severely affected as those chickens which are under-sized, badly fed, and housed or infested with other parasites. Any circumstances which lower the resistance of the birds to disease will render them more susceptible to coccidiosis.

In the chronic form of the disease, which is mostly seen in adult birds, there is a general unthriftiness associated with a gradual wasting and persistent diarrhœa. Anæmia is also usually pronounced.

Post Mortem Appearances.

Post-mortem changes are confined to the intestines and they vary with the severity of the disease and the species of coccidia concerned. Various portions of the intestine or the cæca may be affected. In the acute cases the walls become greatly thickened and numerous red blood spots may be seen along the affected areas. Bleeding occurs into the bowel, which may be full of a mixture of diarrhœic fæces and blood, or it may contain extensive blood clots. In other cases, particularly in the cæca, a greyish-yellow core of cheese-like consistency may be found. The lining membrane of the bowel is usually destroyed along the affected areas. In many fatal cases no pronounced naked eye changes can be seen, and the disease can only be diagnosed by means of the microscope.

Diagnosis.

It is impossible to make a positive diagnosis of coccidiosis from the symptoms, and post-mortem findings for similar changes may be seen in other diseases. However, when a serious mortality occurs in chickens over two weeks old this disease should be suspected. When losses are experienced in young birds—i.e., from hatching to two weeks—the cause is more likely to be due to the disease known as Bacillary White Diarrhœa.

Positive diagnosis of coccidiosis can only be made with the aid of the microscope, when coccidia in the intestinal wall and in the droppings are demonstrated. These parasites are quite characteristic, and they vary in number according to the severity and the stage of the disease. When coccidiosis is suspected, two live chickens showing definite symptoms should be submitted to the Animal Health Station, Yeerongpilly.

Treatment.

The medicinal treatment of coccidiosis has not been very satisfactory. It is much better to prevent the disease than to attempt to cure it.

The trouble will die out of its own accord if very strict measures to prevent reinfestation of the birds are carried out. The following treatments should be tried, and they will give some relief:—

(1) A high protein diet with up to 40 per cent. of a milk product. This should be kept up until the disease is definitely on the wane. Butter-milk, milk powder, skim milk, or sour milk may be used. Poultry farmers are advised to make use of the cheapest milk product available, but care should be taken to see that only wholesome products are fed. A mixture of the following ingredients has been found satisfactory:—

	lb.
Dried, skim milk or butter milk ..	40
Wheat bran	10
Ground grain	50

This mash should be fed immediately the disease is diagnosed, and a restricted amount of grain may be fed once or twice daily. This ration should be fed from one to two weeks, when a gradual change may be made back to the usual ration. Greens or cod-liver oil should also be available all the time.

(2) A high protein ration, together with iodised milk. Iodised milk is made as follows:—

1 gram	Iodine
2 grams	Potassium iodide

are dissolved in 2 oz. of water. This is added to 1 pint of milk, and the mixture is heated until it becomes white. This milk is then added to 1 gallon of water. The chickens are given as much as they will drink.

If sanitary measures are neglected, little benefit can be expected from the above treatments.

Following an outbreak of the disease, general treatment should be aimed at.

(1) Removal of all factors which may tend to lower the body resistance of the chickens.

(2) The prevention of further infestation with coccidia.

(3) The prevention of the spread of the disease to any further batches of chickens which have not become infested.

In order to do this it is essential that the chickens should not be overcrowded, and that there should be ample space at the feeding and watering places. The hoppers and water-troughs should be arranged so that there is no risk of contamination with the dropping from infected birds. All sick chickens should be isolated immediately, for at an early period of the sickness the droppings become heavily charged with the infective stage of the parasite.

Prevention and Control.

It is most important that rigid sanitation measures should be carried out if prevention and control is to be attempted. As all types of coccidiosis die out promptly if reinfection per medium of contaminated droppings is prevented, it is obvious that thorough and regular cleaning of poultry houses will be the most effective method of stamping out the disease. Immediately an outbreak is diagnosed the following measures should be adopted:—

(1) Collect and burn all litter and droppings and thoroughly wash the incubators and brooders with a hot disinfectant solution, such as a 5 per cent. cyllin. As the cysts are extremely susceptible to increases in temperature, the use of hot solutions is recommended. Success has also been claimed when disinfection by means of the flame of a blow-lamp has been carried out. Another method of disinfection is to spray the houses, litter, &c., with a solution made by mixing 1 part of a coal-tar disinfectant with 9 parts of a light mineral oil. None of these methods are 100 per cent. effective, but they all destroy the majority of the infective cysts.

(2) The floor of the houses should be swept clean; the droppings removed every forty-eight hours, or preferably every twenty-four hours; this should be done for at least a fortnight, and during this time the chickens should be confined to the houses. Standing chickens on wire-netting as in the battery method of rearing is most effective, as then the droppings can be collected from a tray beneath the netting and the chickens remain free of contamination.

Dark, damp fowlhouses should be avoided, as these situations are most favourable for the preservation of the cysts. As previously stated, the cysts are highly resistant, and they may remain infective in the soil for twelve months or more; so that if no attempt is made to destroy the infection the disease may appear in the chickens each year. Following an outbreak the soil of the houses and yards should be dug up and ground quick lime mixed through it at the rate of $1\frac{1}{4}$ lb. per square yard. Alternately the surface soil to a depth of 3 in. may be removed and replaced by soil from areas to which poultry have had no access. The latter is the better method and is quite practicable when only a small area is to be dealt with.

As a number of old birds remain chronic carriers and continually pass the cysts out in their droppings, it is advisable that the older birds should never have access to the chicken-houses. It is also essential that the droppings from older birds should not be carried in on the boots, &c., of attendants.

Recent work in other parts of the world has demonstrated that an immunity is produced following an attack of the disease. Experiments indicate that it is possible to produce a mild attack with a subsequent immunity by feeding a limited number of weakened cysts to susceptible chickens. The methods, however, have not been perfected, and this means of immunising has not yet been attempted in Australia.

USEFUL FARM HOE.

Take an old, worn shovel, and cut from A to B as shown on the illustration. Then bend to form a hoe, as shown. When the edge is sharpened, this tool is good

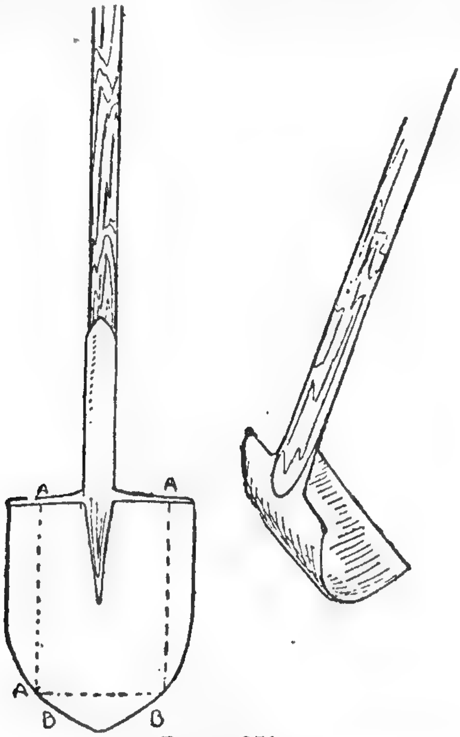


Plate 251.

for cutting weeds, hoeing potatoes and grubbing blackberries, as well as several other jobs on the farm.—"The Canegrowers' Weekly" (Mackay).

Weeds of Queensland.

By C. T. WHITE, Government Botanist.

CREEPING KNAPWEED (*Centaurea repens*).

Description.—A perennial thistle-like plant, with underground stems (rhizomes) sending up flowering branches every here and there about 2 ft. high. Stems rather woody, both leaves and stems covered with a close coating of hairs giving the whole plant a grey appearance. Leaves ½ to 1½ in. long, narrow and mostly under 1¼ in. broad, toothed on the edges. Flower heads small, narrow-ovoid in the lower part, spreading in the upper, outer involucral bracts broad with scarious ends, intermediate ones narrower, upper and innermost with plumose tips. Seeds (achenes) brown, about one line long.

Distribution.—I can find few references to this plant in the literature available to me; all give it as a native of the Orient, by which I suppose it to be a native of Asia Minor or countries at the eastern end of the Mediterranean and bordering the Red Sea.

Botanical Name.—*Centaurea;* the Centaur Chiron is supposed to have cured the wound in his foot made by the arrow of Hercules from the juice of a species of this genus or an allied plant; *repens,* Latin meaning creeping.

Properties.—This plant is not known to possess any poisonous or harmful properties.

Control.—Frequent cutting to prevent seed formation, and more especially to starve the underground stems by depriving them of the food-assimilating green leaves is the best method of eradication where it can conveniently be used.

The Creeping Knapweed has been in Queensland for some years; the first specimens we received were from Cambooya in 1916. In January, 1919, specimens were received from Toowoomba, where a couple of little patches had come up in a farmer's paddock, and he suspected the weed was introduced three years previously in New Zealand oats. Specimens were received again in November, 1926, from Mr. A. B. Copeman, head teacher, Rural School, Clifton, with the report that it had recently appeared on a farm at King's Creek, was growing freely in heavy black soil, and seemed to disregard such things as droughts. All these specimens had been too poor or fragmentary for satisfactory determinations, but excellent material was received in March this year from the Clifton Shire Council, who reported it was a weed new to the district, but not yet spread to any extent. Fortunately, though having the power to become a distinct menace, it has not so far become aggressive under Queensland conditions, and the control methods mentioned above should be efficient.

Botanical Reference.—*Centaurea repens L.* sp. Pl. ed. II., 1233.

Acknowledgment.—I am indebted to the Director of the Royal Botanic Gardens, Kew (England), Sir Arthur W. Hill, for the correct specific determination of this plant.

MELILOT OR HEXHAM SCENT (*Melilotus indica*).

Description.—An upright annual giving off a peculiar and characteristic "coumarin" odour. Leaves trifoliate (composed of three leaflets);

Plate 252.
Creeping Knapweed (*Centaurea repens*).

PLATE 253.
MELILOT OR HEXHAM SCENT (*Melilotus indica*).

leaflets toothed ¾ to 1 in. long, common leaf-stalk or petiole about ½ in. long. Flowers small yellow in slender spikes in the leaf axils, the spike with its stalk (peduncle) about 1 in. long, lengthening in seed to three or four times this length. Pod small, globose or ovoid, slightly wrinkled, and enclosing a single seed.

Distribution.—A native of Southern Europe, Northern Africa, and Western Asia, but now widely spread as a weed in many warm, temperate and sub-tropical countries.

Botanical Name.—*Melilotus* from the Latin mel—honey, and Lotus, an allied genus of plants. Some of the genus *Melilotus*, which includes the Sweet or Bokhard Clover, are valuable bee plants. In Queensland previously and in most Australian works it has generally been recorded as *Melilotus parviflora*, but the specific name *indica* has fifteen years priority, and is the one now generally accepted by botanists.

Common Names.—Small-flowered Melilot; Yellow-flowered Melilot; King Island Melilot; and Hexham Scent are all names that have been applied to it. In Western Australia it is sometimes said to be known as Naninup Weed.

Properties.—It was boomed as a fodder in Australia some years ago under the name of King Island Melilot, but our experience in Queensland has been that stock do not take very readily to it and have to become accustomed to the peculiar odour and flavour. It has the great disadvantage of tainting milk and cream rather badly. It is short-lived, being at its best during the spring months, dying off at the approach of hot weather towards the end of October or early November. As a fodder plant for Queensland for winter and spring months it is poor compared with some of the annual trefoils and clovers, such as the common burr trefoil and cluster clover.

It is a common weed of wheatfields, and if reaped with the wheat and stored for any period the peculiar penetrating odour is communicated to the flour and bread subsequently made.

Control.—Ploughed in, especially in the young stages, the plant will make a valuable green manure. Cut off near the ground level when it is in flower it will shoot again with numerous short branches, and the cutting will have to be done several times before the root is exhausted; the best time to cut is at the end of the flowering season, just before the seed ripens. In smaller areas, hand-pulling or chipping or digging can be resorted to.

Botanical References.—*Melilotus indica* (L.) Allioni. Fl. Ped. 308 (1785). *Melilotus parviflora* Desf. Fl. Atl. 2, p. 192 (1800). See note under "Botanical Name."

The Poisoning of Undergrowth with Arsenic Pentoxide.

By F. SKINNER (Field Cadet, Agricultural Branch).

IN these times, when production costs have to be carefully weighed, the farmer is seeking the cheapest and speediest method of clearing new areas of land which are carrying useless undergrowth.

The purpose of this article is to offer helpful suggestions which are based on a close study of the methods employed in tree-poisoning.

In recent years full recognition has been given to the advantages of arsenic pentoxide as a plant poison, as an alternative to sodium arsenite, which was formerly used. With sodium arsenite, the preparation of the solution involved the mixing of either washing soda or caustic soda with the white arsenious oxide to convert it into a readily active agent.

In the case of arsenic pentoxide, it is soluble in cold water, and no waste of time or labour is incurred in its preparation. This poison is now being extensively used, and its cheapness, combined with effective results, commends it for the eradication of practically all species of undergrowth and green timber.

The poison acts very rapidly on plant life, and, if correctly applied, results will become apparent after two days. In the case of larger trees, the foliage will commence to wither about four days after treatment. Its action on foliage is both rapid and severe, and, as arsenic pentoxide is a dehydrating agent, the leaves wither in a very short time. Their discolouration is due to the oxidisation of the chlorophyll, or green colouring pigment within the epidermal cells of the leaves.

In using this preparation the soil surrounding the poisoned plant is not affected, and, consequently, no damage is sustained by herbage or other plant life.

Mixing.

As arsenic pentoxide solution has a corrosive action on iron and tin containers, it is necessary to use either wooden or copper vessels.

Usually the substance is lumpy, so it is advisable to prepare the day's mixture overnight in order to allow ample time for it to dissolve. Before using, stir well—the liquid should now be practically colourless. If to be used as a spray, add half a pint of molasses as a sticker or spreader per gallon of poison.

Strength of Poison.

The most effective mixture is 2 lb. of arsenic pentoxide per gallon of water. For spraying tender foliage or suckers, ½ a lb. per gallon is sufficient.

Methods of Application.

As a general rule, for the treatment of all undergrowth the cuts must be made as near ground level as possible. This work is done with a brush-hook. Two operators are necessary—one using the brush hook and the other following closely with the swab or spray, according to the area to be treated.

Small areas up to several acres can be most economically treated by swabbing. The cut surfaces should be thoroughly poisoned. An ordinary kitchen mop for washing cups, &c., makes a first-class swab. Any grocer stocks them.

Large areas require a quicker method, so in order to save time a lead-coated knapsack spray is recommended. This costs about £3 15s., and holds about 3 gallons. The spray pump requires to be equipped with a nozzle designed to throw a fine cone of spray, and the inclusion of an auto-pop shut-off valve permits the operator to control the flow of spray by thumb pressure. This is not a standard fitting, but is well worth the cost (approximately 10s. 6d.).

As this spray operates under pressure, the work can be done thoroughly and speedily—the poison is forced into all cracks and crevices, thus making for a complete kill. Remember to always hold the nozzle as near to the cut surfaces as possible.

It may be mentioned that this spray pump has numerous uses on any farm, orchard, or garden, apart from tree-poisoning.

Another method is a little slower, but saves labour, as the brushing is done independently of the spraying. After the growth has been cut allow it to dry and then fire it. Within a very short time new growth appears, and before these shoots attain a length of 12 inches spray them with the weaker mixture—namely, ½ lb. per gallon. Being so tender, they are easily killed, and absorb and transmit sufficient poison to the roots to kill the stump.

Lantana is easily treated by this method.

Tall timber can be effectively poisoned by frilling—a process somewhat similar to ringbarking. The only difference is that the cuts are downwards deep into the wood, but the bark is not removed.

The mixture (2 lb. per gallon) is poured into the open cut. Oak, wattle, stringbark, bloodwood, blackbutt, ironbark, turpentine, and tallowwood are all, relatively, simple to kill. However, care must be taken with gums and ti-tree to prevent suckering. Box is the most difficult to kill, as it has a large underground crown. Particular attention must be given to it, and when treating the saplings it is advisable to also spray the bark at ground level. Clumps of suckers arising from an old stump should all be sprayed.

The so-called wild tobacco (*Solanum auriculatum*), which is such a pest in some localities, can be successfully eradicated with arsenic pentoxide.

Time of Application.

To obtain the best results and reduce suckering to a minimum, poisoning should be performed when the sap flow is less vigorous and the vegetation is passing into the dormant stage. This period varies in accordance with the climatic conditions obtaining in different districts, but usually it commences about March.

It is inadvisable to conduct poisoning operations any later than July.

The best results are usually obtained during a warm, dry period when transpiration losses are high and the soil moisture content is low.

Care and Handling.

Arsenic pentoxide must at all times be regarded as a very dangerous poison, and great care must be exercised when handling it. Finger-nails are taken off very easily if the solution gets around them. It is always wise to keep a supply of fresh water close at hand in case the operator gets splashed with the poison.

Prevent the access of stock to any treated area for three or four weeks after poisoning, especially if molasses has been mixed with the poison.

Keep lids on tins when not in use, as arsenic pentoxide is a hygroscopic substance and will draw moisture from the atmosphere, and this will result in incorrect weights being obtained.

The chief care of the spray pump consists of a thorough cleansing after use.

Arsenic pentoxide can be obtained from the Prickly-pear and Noxious Weeds Section, Lands Department, Brisbane, at the concession rate of 5s. per 20 lb. tin., f.o.r.

Acknowledgment.

Our thanks are due to Mr. S. Walker, Upper Coomera, for his assistance and co-operation in the work of conducting a recent series of timber-poisoning experiments.

MOSQUITO CONTROL.

The mosquito which occurs most commonly in dwellings is the grey-brown *Culex fatigans*, which, during the daytime, may be found sheltering in dark corners of rooms, behind wardrobes, clothes, &c. This mosquito is the transmitter of the organism which causes filariasis (the condition known as elephantiasis).

The common house mosquito breeds in water about habitations, and shows a preference for polluted water, tins of liquid manure, or even flower vases in which the water has not been changed for some time. The eggs are laid on the surface of the water and cemented together to form an egg-raft which may consist of many hundreds of eggs. The larva or "wriggler" possesses a syphon or breathing tube which has at its extremity a breathing hole or spiracle. This syphon projects from the upper surface of the tip of the abdomen. The pupa, which is capable of moving rapidly through the water, breathes through a pair of respiratory "trumpets" situated on its back.

The systematic drainage of surface waters is an important factor in the control of mosquitoes. Water tanks or other vessels, such as tins containing water or liquid manure, should be suitably screened to prevent the adults from depositing their eggs therein. The treatment of surface water in pools, drains, &c., with kerosene will kill the larvae and pupae as they come to the surface for air, and also many of the adults which alight upon the surface to deposit their eggs. One fluid ounce of kerosene covers about 15 square feet of water (1 gallon to approximately 2,400 square feet).

The introduction of various species of fish into ponds and lakes will reduce to a minimum the numbers of mosquito larvae and pupae present in those situations.

The screening of habitations to prevent the entry of adult mosquitoes and the use of mosquito nets will give protection from their bites. Kerosene pyrethrum spray, made as follows, will kill adult mosquitoes in the house:—Place 4 oz. of pyrethrum powder in 1 quart of kerosene; mix and shake well, then allow to stand for about eight hours. Strain through fine muslin and add ¾ fluid ounce of methyl salicylate (synthetic oil of wintergreen) after which the mixture is ready for use.

A mixture of citronella (6 parts), kerosene (3 parts), and cocoanut oil (1 part) applied to the hands and face is an effective repellent.

Management of Sown Pastures.

By C. W. WINDERS, B.Sc.Agr., Assistant (Agronomy) in the Agricultural Branch.

INTRODUCTION.

THE aims of pasture management—whether extensive or semi-intensive grazing conditions prevail—are twofold: First, to increase the carrying capacity of the pasture to the maximum and to maintain it at that level; and, secondly, to prevent the pasture from deteriorating, and, if possible, to improve it. These two aims should be pursued concurrently. Production of animal products, such as wool, mutton, beef, milk, or cream, should not be made at the expense of quality of the pasture. In order to strike a balance between the needs of the stock on the one hand and the requirements of the pasture on the other, it is essential to operate a system of pasture management which gives due recognition to the demands of both parties—namely, the stock and the pastures. Different pasture types call for different details of management, but the same basic principles underlie every efficient grazing scheme.

What is known as the " intensive system of pasture management " embodies all the refinements of good grazing practices, but some modifications of this system are necessary for Queensland conditions. The intensive system, which was evolved in Germany during the Great War, employs scientific methods of feeding pasture to stock. The object is to systematically feed off the pasture at the stage of maximum food value, and to accomplish this it is necessary to concentrate stock at many times the normal rate upon the pastures for periods correspondingly shortened for each paddock. This means the provision of a number of paddocks and their rotational grazing. On dairy farms in those countries where, because of regular and uniform rainfall, it is possible to adhere to an orderly plan of rotation, it is usual to either follow the milkers with dry cattle to clean up any rough herbage, or to level the rough grass by a mower. Other important aspects of the system are the utilisation of the surplus of grass produced in the flush of the year, harrowing after grazing to distribute dung, renovating to reinvigorate the pasture, and systematic top-dressing with phosphates and nitrogenous manures.

MANAGEMENT OF PASPALUM PASTURES.

Subdivision of Paddocks.

Paddocks of 20 or more acres are the usual thing on a great number of dairy farms, and it is to the size of the paddocks and lack of proper management that the typical pasture conditions existing on such farms can be attributed. Under the conditions of uncontrolled grazing, the pastures during the flush of their growth consist characteristically of a series of closely grazed patches interspersed with rank growth which is either not eaten at all or is left until the following autumn or winter, when it has much deteriorated in food value. As often more than half the pasture consists of untouched rank growth, it is easy to visualise the large amount of waste that occurs. The explanation of such uneven grazing lies in the fact of the cow's preference for the short, leafy grass, which has a much greater feeding value than the same grass when it has become rank and stemmy, for when a cow is turned into a paddock

which supplies a superabundance of feed she will graze the pasture in patches and will return again and again to these short patches, neglecting the overgrown clumps.

As the first step of a procedure designed to keep the pasture at the short, leafy stage, it is necessary to provide a series of small paddocks which may be grazed in rotation. The extent of subdivision depends on the size of the herd, for it has been found that for pastures similar to our coastal paspalum pastures a rapid feeding-off of a paddock is obtained by concentrating ten to twelve animals per acre upon it. Thus a farm milking on an average thirty cows should have a number of paddocks of 2½ to 3 acres, with sixty cows, 5 to 6 acres; and so on.

The number of paddocks should be six or more, as this will allow each paddock to be grazed for a few days when the paspalum is 5 to 6 inches high, and is of high feed value. Under favourable seasonal conditions, using six paddocks, paddock No. 1 should be ready for grazing again after the other five have been grazed in rotation; but where there is great risk of sudden rainfall deficiency or superabundance it would be wise to have nine or ten paddocks for rotational grazing purposes.

Great care must be given to the layout of the paddocks in order to provide for the most convenient movement of the stock and their easy access to water. Water should be provided in each paddock or in a laneway into which the paddocks open. Laneways used by the cattle should be at least 2 chains wide, in order to reduce puddling to a minimum in wet weather, and to prevent injury by horning due to overcrowding.

When subdividing paddocks, it is unnecessary to erect stout four-barbed fences, for experience has shown that a fence of two barbs with posts 20 to 25 feet apart, with two droppers between—iron or wooden—will hold the cows quite well, except if rogues are present. Good straining posts at each end are, however, essential. Along the laneways a three or four wire fence, with posts 18 feet apart and one dropper between, is satisfactory.

Rotational Grazing.

As the aim is the systematic provision of the short bite, the pasture must not be allowed to grow rank, innutritious, and unpalatable. The short, green growth, 4 to 6 inches high, should be eaten off quickly by the milkers, and before it becomes necessary for them to forage for a good bite the cows should be removed to the paddock next in the rotation. Dry stock take the place of the milking cows in the first paddock to clean up any irregularities, and where these are unable to cope with the work it will be necessary to mow any clumps that may be left. If patches of long grass are allowed to remain in the paddock the area of short young pasture at next feeding is correspondingly reduced. Feeding the pasture too hard reduces the capacity of the plants to respond quickly and produce new leaf growth.

Spreading Animal Droppings.

A paddock after being grazed has a scattering of droppings over its area, and great improvement of the pasturage is effected by harrowing the dung before it becomes too hard. The dung contains a fair proportion of the original food value of the grass, and if a dropping is allowed to lie undisturbed the plant foods contained within it will lead to a rank growth of the grass in the immediate vicinity of the

dropping. If, however, a special pasture harrow or an ordinary harrow about which several lengths of barbed wire are loosely coiled is run over the paddock the fertilizing ingredients are more uniformly spread over the field and the grass is evenly benefited.

Renovation of Paspalum Pastures.

On many old-established paspalum areas which have received little or no attention directed towards the welfare of the pasture, there has been formed a more or less pure turf so stunted and sodbound that little feed is produced from the paspalum itself, and conditions are too hard for any associate species, such as white clover, to thrive. When this sodbound stage is reached the cover formed by the turf over the soil precludes easy access of water and of free air, and to allow these natural recuperating influences to operate it is necessary to break up the matted grass.

On badly matted areas ploughing-up the paspalum is perhaps the only satisfactory way of reinvigorating the pasture. This operation should be carried out during the rainy season of late summer, the land being ploughed sufficiently deep to allow of the sod being turned on its side and then levelled off with the harrows. (Shallow ploughing, by turning the slice right over and exposing most of the roots to the air, tends to destroy the paspalum.) Such drastic treatment as ploughing of the pasture will throw the treated area out of production for some months, but if the farm is subdivided into small areas one paddock may be ploughed each year, thus providing for the turning over of each paspalum paddock once every five or six years. The temporary loss of feed occasioned by severe renovation will be more than compensated for by the improved condition of the pasturage during subsequent years. After the ploughing and working-down of the area a mixture of winter legumes could be broadcasted.

On areas not badly matted good results have followed treatment in early autumn by special paspalum renovators. This is very heavy work, and considerable horse-power is required to do satisfactory work with such implements. In those cases where points of different sizes may be fitted it is advisable to renovate in one direction with the fine points and then to cross-renovate, using the broader points. Before renovating, it is wise to mow any long, coarse grass on the area. Renovation by these means not only aerates the soil, but removes loose and dead grass, and provides good soil conditions for the broadcasting of legumes such as red clover, white clover, and lucerne.

Lime and Fertilizer Treatment.

Where it is believed that a particular area of pasture land is deficient in lime, steps should be taken to test the effect of top-dressing portion of the area with agricultural lime at the rate of 10 cwt. or 1 ton to the acre. Liming should be carried out well in advance of any fertilizer treatment. If the pasture shows benefit from lime treatment the dressing should be repeated every three years.

A certain amount of experimental work has been carried out in Queensland in connection with top-dressing of paspalum pastures, and good results have in some instances been obtained. It is advisable for farmers to experiment with different types and quantities of fertilizers

on their own farms, in order to learn what is the most economic dressing to apply. It may happen that a top-dressing with 1 or 2 cwt. of superphosphate in the autumn of each year will prove a satisfactory proposition, and it may also be economically sound to apply autumn and late winter dressings of sulphate of ammonia in order to force growth in the off-season. Mowing of any roughage and the renovation of the pasture should always precede top-dressing; otherwise there is a very considerable waste of fertilizer.

Conservation of Grass.

During the period of summer rains the dairy animals are unable to cope with the prolific growth of grass, and where an efficient system of pasture management is not followed it usually happens that most of the surplus grass is wasted. This summer surplus should be conserved as pasture hay or as grass silage. On those farms which are well subdivided, during the flush of the season when it is difficult to keep the grass fed off, one or two of the paddocks could be shut up and the grass allowed to go to the hay or silage stage and then mown. In the paspalum areas of Southern Queensland conditions during the flush of growth are generally too wet to allow of satisfactory curing of hay; consequently, the ensiling of the grass is recommended, since the value of grass for silage is not lowered by light falls of rain on the cut material.

Though, as mentioned previously, the young, leafy growth is richest in nutrients, it will be found that the most satisfactory stage of cutting for economical feeding is when the grass has made rapid and luxuriant growth, with the seed-heads just formed but not yet flowering. If the grass is very mature before being harvested, or is allowed to become too dry before being stacked, a charred product will result.

The grass may be conserved in tower, pit, trench, or stack silos. If the farm is already provided with a tower silo, this may be used to store the grass, which can be filled into the silo by an elevator or by a mast stacker and grab. The stack silo possesses the great advantage that it can be built out in the field which is being cut, but there is a fairly great wastage of material. The pit silo is suitable only where the location and soil are appropriate, but it is cheap to construct and to fill. A handy form of pit silo is the trench silo, which has batters at each end, allowing the team horses to aid in tramping the material.

The stack is particularly favoured for grass silage. If sufficient grass is available a round stack about 14 feet in diameter should be planned; this, when built up to about 14 feet, will contain about 30 tons of silage. The grass is cut with the mowing machine and conveyed to the stack on a tumble sweep. A mast and boom grab stacker is necessary to reduce the labour of elevating the material as the height of the stack increases. Each day no more should be cut than can be stacked on the same day. The outside must be kept well trampled, and the centre kept level until finishing off, when the top should be rounded and sealed with a depth of a foot or so of earth.

A trench silo should be at least 7 feet deep and long in proportion to its width. In filling, the horses can be driven lengthwise through the pit, and their trampling gives better consolidation and exclusion of air.

Grass silage requires a couple of months to mature, and then may be fed out. As deterioration on exposure to air is rapid, it is essential to uncover only a small section of the ensiled material at one time.

MANAGEMENT OF RHODES GRASS PASTURES.

Many of the points mentioned under the preceding section are just as applicable to Rhodes grass pastures as they are to paspalum pastures. The farm should be suitably subdivided to allow for rotational grazing, and the grazing should be efficiently controlled so that each paddock is eaten off when the growth is young and leafy and no clumps allowed to remain. Hard grazing must be avoided, particularly on light soils. The scattering of the manure lying on the pasture should be regularly carried out in order to effect a uniform improvement in the growth of the grass.

Mechanical treatment of Rhodes grass pastures is productive of good results, the use of a strong tyne cultivator breaking up consolidated soil and allowing free ingress of air and water and also removing dead trash.

Rhodes grass makes excellent hay, and the summer surplus grown in paddocks over which a mower can be operated should be conserved as hay for feeding during the winter and early spring months, when natural feed is poor in quality and in quantity.

MANAGEMENT OF NATIVE GRASS AREAS ON FARMS.

In most of the agricultural districts the area of native pasture utilised for grazing is small compared with the acreage of introduced grasses such as paspalum and Rhodes grass, and usually the native grass pastures are restricted to the poorer types of forest soils. On parts of the Darling Downs, however, where dairying is a sideline to crop production, native pastures are utilised for grazing in conjunction with fodder crops. Such native pastures have established themselves naturally, either after ringbarking or clearing of the forest, or on paddocks gone out of cultivation. The former class of pasture is difficult to improve. A very slow improvement may be effected by top-dressing with superphosphate to encourage the development of native legumes present in the pasture, or by running a cultivator over the pasture in early autumn and broadcasting seed of hardy legumes such as cluster clover and English trefoil. Marked improvement of these native pasture areas can only be effected by breaking up the land and cropping it for a season or two with annuals preparatory to sowing down suitable permanent pasture mixtures, either summer growers or winter growers. The native pasture, as such, is very valuable on the Downs, as it contains a large proportion of winter-growing species, such as wallaby grass, spear grass, plume grass, &c., but better winter pastures as well as permanent summer grass should be established on all farms, and the areas carrying native grass could gradually be converted into more productive paddocks. The old cultivation paddocks which have been allowed to revert to weeds and annual grasses such as barley grass, wallaby grass, &c., make fairly good pasture areas, and can be improved by the incorporation of useful grasses and legumes. As opportunity permits, these areas, after being restored to a fairly high level of fertility by the growing of legumes and green manuring, should be sown to permanent grass or to crops.

MANAGEMENT OF WINTER PASTURES.

Since the establishment of winter pastures entails a good deal of labour and expense, they must obviously receive very special treatment if the expenditure is to be recouped. Only relatively small areas of

winter pasturage will be available on most farms, and the temptation to stock these paddocks heavily during the months when the "broad acres" are unproductive must be resisted. Such pastures should as far as possible be reserved for cows in production, for breeding ewes, or for fattening stock. The pastures should not be stocked too early in the growing season, but must be allowed to make good growth before grazing. The animals should be allowed on to a paddock of winter pasture for about an hour a day, and they should be removed sooner if they begin to lie down. Camping on the area should be avoided, as the pasture becomes fouled and distasteful to the stock. Sufficient stock should be used to eat a paddock down in a week, and the pasture must not be too closely grazed. After the completion of a grazing the harrows should be run over the paddock to scatter the droppings. The pasture must be given ample time to recover and produce good feed before being grazed again. The aim should be to provide sufficient paddocks of winter grass to allow of rotational grazing and a continuous supply of green nutritious feed.

Certain of the annual winter pasture plants are self-regenerating —namely, Italian rye grass, Wimmera rye grass, and prairie grass— and towards the end of the growing season pastures of these grasses must be left unstocked in order to allow seed to be matured and disseminated. Areas which have been so treated should be lightly harrowed in early autumn to make a seed-bed for the establishment of seedlings produced by the self-sown seed.

HINTS ON GENERAL GRAZING FARM MANAGEMENT.

In subdividing the grazing area of a farm, care must be taken to include only one type of pasture in each paddock. If an area of poor pasture and an area of better pasture occur in the one paddock the stock will neglect the inferior grass and concentrate upon the good-class pasture, to the detriment of the paddock as a whole. A similar preference is shown for the top-dressed portions of a paddock which has not been uniformly treated.

Suitable shade should be provided for the stock in hot weather, and shelters for protection during cold weather. The location of these resting-places should be chosen with a thought to the conservation of the animal's excreta. If the paddock slopes to a creek or a river the animals should be encouraged to rest near the top of the slope, because if they camp along the watercourse heavy rains will wash the droppings away and remove a large amount of fertilizing material which, by careful attention to the layout of shade and shelter facilities, could be retained on the pasture area.

The several classes of live stock have different grazing habits, and a proper appreciation of these habits will enable a much better utilisation of the pasture resources on a property to be achieved. Sown pastures in Queensland are used primarily for dairy cattle, though of recent years fat sheep and beef cattle have been raised in increasing numbers partly on sown pasturage. Cattle are the most efficient grazers, inasmuch as they graze more uniformly than other classes of live stock. Sheep are more selective in their grazing, paying greatest attention to the finer constituents of the pasture and neglecting the coarser elements. Horse paddocks, it is usually noticed, deteriorate much more rapidly than other pastures, the horses allowing the coarser grasses to increase

by neglecting them in favour of the fine grasses, the latter eventually being eaten out altogether. Sheep, and goats also, eat some weeds more readily, and are thus useful on dairy farms for cleaning up the pastures. For most types of pasture it is found that most efficient grazing is attained by carrying two or three classes of live stock, but this is not always practicable. The pastures in lightly timbered country on the Darling Downs and in the Maranoa, many of which are used for sheep-raising, require after an exceptionally favourable period of rainfall to be eaten off by cattle before the sheep can make good use of them. In some mixed pastures there are plants especially palatable to cattle and others particularly liked by sheep, and these preferences should be noted and appropriate use made of the knowledge during the grazing period.

The burning of paspalum, Rhodes grass, and other pastures is quite common in Queensland, the object being to get rid of accumulated trash and coarse, dry material, and to encourage the production of an early bite in the spring. No information is available to indicate what precisely is the effect of burning on such pastures, but there is no doubt that firing results in the loss of a large amount of organic matter, and probably has other harmful effects if regularly carried out. There is much to be said in favour of the view that the few benefits obtained from burning could no doubt be obtained by the adoption of a system of pasture management involving periodic heavy grazing, the use of the mower, and the harrowing of the pasture.

HORSES REQUIRE CLEAN WATER.

Horses require anything from 5 to 15 gallons of water a day, the quantity depending on the temperature and the amount of work performed. The water should be as pure as possible, clear in appearance, and free from taste, colour, or smell. Pure water is just as essential to a horse as it is to a man, and it is a mistake to suppose that a horse can drink badly contaminated water with impunity. Water obtained from pools or shallow wells contaminated with surface drainage, or containing decomposing organic matter, frequently causes diarrhoea, and generally predisposes to colic. Water that contains a large amount of sediment should not be given, as the sediment causes a mechanical irritation of the mucous membrane of the stomach and intestines—i.e., sand colic.

When the horse is at rest in the stable water should be given three times a day, and should invariably be given previous to feeding. This latter point is of considerable practical importance. A horse's stomach is small in proportion to the animal's size, and water does not remain in it, but passes through the stomach and small bowel to the cæcum, or water-gut. If water is given after feeding, besides weakening the digestive juices, a considerable portion of the food in the stomach and small intestines will be washed out in an undigested state, and indigestion and colic may result. Water in small quantities can be given within an hour or so from the completion of feeding, if desired.

After a long journey it is a good plan to water a mile or so before the journey's end, and take the horse slowly in afterwards. This prevents chills and colic due to the ingestion of a large quantity of water when in an exhausted state. An animal after prolonged exertion or fast work has its system depleted of fluid. It will not eat sufficiently until its thirst has been satisfied; therefore, the water should come first, and while the animal is still warm is the best time to give it. After standing, the body temperature falls, and to give cold water freely then is only to intensify the effect of the cold water on the system.

Refrigerating Brines.

By L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

REFRIGERATION has a very important influence on the dairying industry. It is utilised for the freezing of ice-cream mixes, the manufacture of ice used in transportation of dairy produce, the cooling of water for butter-washing, the rapid cooling of pasteurised milk and cream, and for controlling the temperature of cold-storage rooms. It plays a most important part in the manufacture of butter, because the careful control of temperature from the time the cream is received at the factory until the butter reaches the consumer has an important bearing on the quality of this product. Since the financial return to a factory is largely governed by the quality of its product, the efficiency of the refrigeration unit is a matter of sufficient importance to warrant more attention than it apparently receives at present.

In the butter industry both the direct expansion system and the brine circulating system are used, and each may be claimed to be efficient in its particular sphere. The brine system differs from the direct expansion system in so far that refrigerating power is stored in the brine, and it only requires a circulating pump to fully utilise this power after the refrigerating plant is stopped. With the direct expansion system refrigeration ceases with the stopping of the refrigerating plant.

Kinds of Brine.

Of the many commercial products offered for brine making, two have been widely employed—namely, sodium chloride or salt, and calcium chloride. Of the two, calcium chloride appears to have become the more widely used. The advantages claimed for calcium chloride brine are that it is less corrosive than salt, and lower temperatures are attainable. It has a bitter taste, however, and brine-leaks therefore should be immediately attended to, especially where there is a danger of contamination of milk or cream. Where a brine-leak occurs in contact with air, corrosion almost invariably ensues, particularly with salt brines, and this is a further reason why brine-leaks should never be neglected.

Strength of Brine.

The strength of the brine varies according to the purpose for which it is to be used. A brine with a specific gravity of 1·17 to 1·18 has been found to be most suitable for butter-factory work, while for icemaking a specific gravity of 1·13 to 1·15 gives good results. A strong brine is less corrosive than a weak brine, but an excessively strong brine increases the tendency to crystallise and greatly increases the load on the pumps.

Tables I. and II. show the properties of sodium chloride and calcium chloride brines respectively. In these tables no reference is made to such arbitrary scales as Baumé, Twaddell, and Salometer scales, which are at times used in various industries for controlling the strength of

brines, lyes, &c. Their use is not recommended for a number of reasons, among which may be mentioned—

(1) The information obtained from their use is practically valueless unless the specific gravity is also shown.

(2) For liquids heavier than water there are Baumé hydrometers graduated in—

(*a*) The original Baumé degrees;

(*b*) The "rational" Baumé degrees;

(*c*) The American Baumé degrees.

(3) For liquids lighter than water there are the same three Baumé scales.

(4) The "heavier than water" and "lighter than water" Baumé scales overlap, and hence some liquids would give readings on both scales which can only lead to confusion unless the particular Baumé scale in use is known.

TABLE I.

SODIUM CHLORIDE BRINES.

Specific Gravity at 60°F.	Percentage of Sodium Chloride by Weight.	Lb. of Sodium Chloride per 100 Imperial Gallons of Brine.	Lb. of Sodium Chloride per 100 Cubic Feet of Brine.	Lb. of Sodium Chloride per 100 Imperial Gallons of Water.	Lb. of Sodium Chloride per 100 Cubic Feet of Water.	Freezing Point °F.
1·007	1	10·1	63	10·1	63	31·8
1·015	2	20·3	126	20·4	127	29·3
1·022	3	30·7	191	30·9	192	27·8
1·029	4	41·2	257	41·7	260	26·6
1·036	5	51·8	323	52·6	328	25·2
1·044	6	62·6	390	63·8	397	23·9
1·051	7	73·6	458	75·3	469	22·5
1·059	8	84·7	528	87·0	542	21·2
1·066	9	95·9	597	98·9	616	19·9
1·073	10	107·5	668	111·0	692	18·7
1·081	11	119·0	741	123·5	770	17·4
1·089	12	130·5	814	136·5	849	16·0
1·096	13	142·5	888	149·5	930	14·8
1·104	14	154·5	962	163·0	1,013	13·5
1·111	15	166·5	1,038	176·5	1,099	12·2
1·119	16	179·0	1,115	190·5	1,186	11·0
1·127	17	191·5	1,193	205·0	1,275	9·7
1·135	18	204·0	1,272	219·5	1,366	8·5
1·143	19	217·0	1,352	234·5	1,460	7·3
1·151	20	230·0	1,434	250·0	1,557	6·1
1·159	21	243·5	1,517	266·0	1,655	4·9
1·167	22	257·0	1,598	282·0	1,756	3·6
1·176	23	270·5	1,684	299·0	1,860	2·4
1·184	24	284·0	1,770	317·0	1,972	1·2
1·192	25	298·0	1,856	333·5	2,077	0·5
1·201	26	312·0	1,939	351·5	2,190	—1·1

TABLE II.

CALCIUM CHLORIDE BRINES.

Specific Gravity at 60°F.	Percentage of Calcium Chloride (Anhydrous) by Weight.	Pounds of Anhydrous Calcium Chloride.				Pounds of Commercial (80 per cent.) Calcium Chloride.				Freezing Point °F.
		contained in—		to be added to—		contained in—		to be added to—		
		100 Imperial Gallons of Brine.	100 Cubic Feet of Brine.	100 Imperial Gallons of Water.	100 Cubic Feet of Water	100 Imperial Gallons of Brine.	100 Cubic Feet of Brine.	100 Imperial Gallons of Water	100 Cubic Feet of Water	
1·007	1	10·1	63	10·1	63	12·6	78·5	12·6	78	31·1
1·015	2	20·3	126	20·4	127	25·4	158	25·6	160	30·4
1·024	3	30·7	191	30·9	192	38·4	239	38·9	242	29·5
1·032	4	41·2	257	41·7	260	51·5	321	52·6	328	28·6
1·041	5	52·0	324	52·6	328	65·0	405	66·6	415	27·7
1·049	6	63·0	392	63·8	397	78·8	491	81·0	504	26·6
1·058	7	74·0	461	75·3	469	92·5	576	95·9	598	25·5
1·067	8	85·4	532	87·0	542	106·8	666	111·1	692	24·3
1·076	9	96·8	603	98·9	616	121·0	754	126·7	789	22·8
1·085	10	108·5	676	111·0	692	135·5	844	142·5	883	21·[illegible]
1·094	11	120·5	750	123·5	770	150·5	938	159·5	994	19·7
1·103	12	132·5	825	136·5	849	165·5	1,032	176·5	1,100	18·1
1·112	13	144·5	900	149·5	930	180·5	1,125	191·0	1,208	16·3
1·121	14	157·0	978	163·0	1,013	196·5	1,225	211·5	1,318	14·3
1·131	15	169·5	1,056	176·5	1,099	212·0	1,321	230·5	1,436	12·2
1·140	16	182·5	1,137	190·5	1,186	228·0	1,420	250·0	1,558	10·0
1·150	17	195·5	1,218	205·0	1,275	244·0	1,520	270·0	1,683	7·5
1·159	18	208·5	1,299	219·5	1,366	260·5	1,623	290·0	1,806	4·6
1·169	19	222·0	1,383	234·5	1,460	277·5	1,730	311·5	1,941	1·7
1·179	20	236·0	1,470	250·0	1,557	295·0	1,838	333·0	2,075	− 1·4
1·189	21	250·0	1,558	266·0	1,655	[illegible]12·5	1,947	356·0	2,219	− 4·9
1·199	22	264·0	1,645	282·0	1,756	330·0	2,056	379·0	2,361	− 8·6
1·209	23	278·0	1,732	299·0	1,860	348·0	2,169	404·0	2,518	− 11·6
1·219	24	293·0	1,825	317·0	1,972	366·0	2,280	430·0	2,678	− 17·1
1·229	25	307·5	1,915	333·5	2,077	384·5	2,395	454·5	2,830	− 21·8
1·283	30	385·0	2,400	428·5	2,670	481·0	2,998	600·0	3,740	− 54·4
1·338	35	468·0	2,915	538·0	3,350	585·0	3,645	776·0	4,835	+ 2·8

Brine Temperature.

It should be noted (Table II.) that the minimum temperature attainable with calcium chloride brines is that obtained by using a brine with a specific gravity of 1·283. A stronger brine than this only results in a waste of calcium chloride and refrigerating inefficiency.

Purity of Commercial Calcium Chloride.

That portion of Table II. referring to commercial calcium chloride has been calculated for a product containing 80 per cent. of calcium chloride. As the commercial product usually contains from 75 to 80 per cent., these figures must be taken as only approximate. An illustration will show how a 75 per cent. calcium chloride affects the specific gravity of the resultant brine.

A brine of specific gravity 1·179 requires 333 lb. of 80 per cent. calcium chloride per 100 gallons of water. This weight of a 75 per cent. product will give a brine with a specific gravity of only 1·167.

Displacement by Coils.

In preparing a brine the capacity of the brine tank should be known and an allowance made for the capacity of the submerged ammonia coils. This may be calculated from Table III.

TABLE III.

External Diameter of Submerged Piping.	Imperial Gallons Displaced per 100 ft. of Piping.	External Diameter of Submerged Piping.	Imperial Gallons Displaced per 100 ft. of Piping.
In.		In.	
$1\frac{1}{4}$	5·3	2	13·6
$1\frac{1}{2}$	7·6	$2\frac{1}{2}$	21·2
$1\frac{5}{8}$	8·9	3	30·5
$1\frac{3}{4}$	10·3	4	54·4
$1\frac{7}{8}$	12·0	5	84·9

Adjusting the Strength of the Brine.

If the brine in use is found to have a specific gravity of less than 1·17, it may be brought to the correct strength by adding the requisite quantity of sodium chloride or calcium chloride as shown in Table IV.

If the brine has a specific gravity higher than 1·17, it may be weakened or diluted to that specific gravity by adding the required volume of water found from Table V.

TABLE IV.

BRINE STRENGTHENING TABLE.

(To raise the specific gravity of brines to 1·17).

Sodium Chloride (Salt) Brines.		Calcium Chloride Brines.	
Specific Gravity of Brine at 60°F.	Pounds of Sodium Chloride to be added to each 100 Imperial Gallons of Brine.	Specific Gravity of Brine at 60°F.	Pounds of Commercial (80 per cent.) Calcium Chloride to be added to each 100 Imperial Gallons of Brine.
1·17	Nil	1·17	Nil
1·16	19	1·16	19
1·15	37	1·15	39
1·14	55	1·14	58
1·13	73	1·13	77
1·12	91	1·12	95
1·11	108	1·11	114
1·10	126	1·10	134
1·09	143	1·09	153
1·08	160	1·08	172
1·07	177	1·07	190
1·06	195	1·06	208
1·05	209	1·05	225

TABLE V.

BRINE DILUTION TABLE.

(To lower the specific gravity of brine to 1·17).

Sodium Chloride (Salt) Brines).		Calcium Chloride Brines.	
Specific Gravity of Brine at 60°F.	Imperial Gallons of Water to add to each 100 Imperial Gallons of Brine.	Specific Gravity of Brine at 60°F.	Imperial Gallons of Water to add to each 100 Imperial Gallons of Brine.
1·17	Nil	1·17	Nil
1·18	5	1·18	5
1·19	10	1·19	10·5
1·20	15·5	1·20	15·5
1·21	21	1·21	21
		1·22	26
		1·23	31·5
		1·24	36·5
		1·25	42

Corrosion by Brine.

General Precautions.—Iron and galvanised iron are employed almost universally in refrigerating systems. Remarks are therefore confined chiefly to the prevention of corrosion of these substances. The following well-known precautions must be observed if corrosion is to be reduced to a minimum:—

(1) Keep up the strength of the brine, as strong brines are less corrosive than weak brines. Brines may be weakened in a number of ways, such as by condensation of moisture from the atmosphere, leakage of water into the brine system, and by chemical action causing a precipitation.

(2) Keep the brine system as airtight as possible. The access of air allows the absorption of oxygen and carbon dioxide by the brine. Dissolved oxygen causes rusting of iron pipes, while carbon dioxide causes the brine to become acid, and in calcium chloride brines may cause precipitation of calcium carbonate, thus weakening the brine.

(3) Keep the return pipe under the surface of the brine, as this reduces the possibility of oxygen and carbon dioxide being dissolved. A return pipe which ends above the surface causes aeration by carrying bubbles of air into the brine.

(4) Ammonia leakage into the brine causes the formation of ammonium chloride, which even in small quantities accelerates the corrosion of iron and zinc. Ammonia leaks may be best prevented by regular inspections and by so controlling the brine that corrosion of the ammonia coils is reduced to the minimum.

Chemical Corrosion Preventives.

There have been a number of methods suggested for minimising brine corrosion which involve chemical treatment or control. The principal methods are—

1. Addition of silicates.
2. Addition of chromates.
3. Keeping the brine at a definite alkalinity.
4. Controlling the pH between certain definite limits.

Each of these methods is worthy of a brief discussion.

1. *Addition of Silicates.*—It has been found that the addition of sodium silicate or waterglass to soda cleansing agents has been very effective in preventing corrosion to a large number of metals, particularly aluminium and its alloys. Their use in brines has not been so successful, and Hunziker, Cordes, and Nissen[1] state that their use of calcium chloride brines is undesirable. In salt brines the addition of silicates reduced corrosion on a number of metals and alloys, but with galvanised iron and zinc the silicate addition was quite ineffective. The consensus of opinion is that although silicates largely prevent corrosion of iron and steel in fresh water, they have been found ineffective in brines[2].

2. *Addition of Chromates.*—Sodium chromate and dichromate having been found effective in reducing corrosion of tin-plated copper and iron by alkali cleansers, have also been applied to brines with considerable success. Quite a number of investigators([2]), ([3]), ([4]), ([7]) have

recommended its use, and in Europe there are a number of proprietary salts containing chromate for use in refrigeration systems([5]), ([6]). Hunziker, Cordes, and Nissen[1] found that, while the corrosion of most metals was reduced to quite small amounts by this method, it did not appreciably reduce the corrosion of iron and galvanised iron. The Corrosion Committee of the American Society of Refrigerating Engineers recommend that 100 lb. of sodium dichromate and 35 lb. of caustic soda should be used for each 1,000 cubic feet of calcium chloride brine, and double those quantities should be used for sodium chloride brines. They further recommend that from one-quarter to one-half of the above quantities should be added yearly ([2]), ([3]), ([4]). The quantities of caustic soda mentioned above are sufficient to convert the dichromate into the more effective chromate. La Motte, Kenny, and Reed[8] state that the amount of dichromate used should be carefully regulated, since the protective action decreases when the concentration of chromate rises beyond a certain point. All the investigators are unanimous that the brine should be made very slightly alkaline after the dichromate has been added.

3. *Keeping the Brine Alkaline.*—This method appears to be the most widely practiced, but, unfortunately, the term "alkaline" has a very wide meaning. Hunziker[9] states that the alkalinity should be 0·05 per cent. apparently calculated as caustic soda. Poste and Donauer[10] and Bryant[7] state that the alkalinity should be greater than 0·1 per cent. Whitman, Chappell, and Roberts[3] show, however, that a high alkalinity causes pitting to occur, and the investigations of Hunziker, Cordes, and Nissen[1] indicate that high alkalinity is not desirable. The latter investigators indeed obtained a greater degree of corrosion in alkaline brines (0·05 per cent.) than in neutral brines, particularly with zinc and galvanised iron. The general opinion now appears to be that brines should be maintained only slightly alkaline, and modern practice points more and more to the advantages of controlling the pH of the brine, rather than the adoption of an arbitrary percentage of alkalinity.

4. *Controlling the pH Between Certain Definite Limits.*—Whitman, Chappell, and Roberts[3], in their report to the Corrosion Committee of the American Society of Refrigerating Engineers, recommend: "Brines should be maintained very slightly alkaline (pH 9·5). This is the most desirable alkalinity for both iron and zinc in calcium and sodium brines. More acid brines cause increased corrosion, while more alkaline ones cause severe pitting." Britton[11] also states: "With galvanised vessels and pipes corrosive action is at a minimum at pH 9·5 to 10."

With galvanised equipment a protective coating of a zinc compound is formed in weakly alkaline solutions, but this protective coating is dissolved in strongly alkaline and in acid brines.

Summary.

The chemical methods for the prevention of corrosion may be summarised as follows:—

(*a*) Calcium chloride brines should contain 0·16 per cent and sodium chloride brines 0·32 per cent. of sodium chromate, and the pH of the chromate-treated brines should be between 7·5 and 8·5.

(*b*) Both calcium chloride and sodium chloride brines (without chromate) should be maintained at pH 9·5 to 10.

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Cane Trash and Soil Organic Matter.

A VALUABLE contribution on this important topic was presented at the recent International Conference of Sugar Cane Technologists by Mr. C. R. von Stieglitz, of the Bureau staff. This paper embodied the results of a laboratory study designed to demonstrate the influence of heavy additions of trash to the soil, as it affects both the physical condition and the fertility of the land.

The trash was added to the soil in a finely-crushed state, and soil moisture conditions were so regulated as to ensure a rapid rotting of the material. The amount added during the course of six months was equal to the trash and tops which would be derived from 200 tons of cane per acre. By introducing this exaggerated effect, it was possible to gain some idea of what would happen over the course of several years under normal field conditions.

It was found that a very pronounced increase in soil fertility was effected by the treatment, showing that the plantfoods bound up in the trash were readily liberated as the material decomposed. An interesting aspect was the marked increase in soil nitrogen; the gain to the soil was greater than would be expected from the analysis of the trash, showing that by feeding certain groups of soil bacteria with carbohydrate food they were stimulated to absorb atmospheric nitrogen and combine it into a form available to the cane crop.

Contrary to popular supposition, the rotting of the trash rendered the soil less acid than before, and not more so. Farmers often express the opinion that organic matter will make the soil sour, necessitating an application of lime to correct this defect.

The physical condition of the land was very definitely improved by the trash addition. This was reflected in the improvement in the available moisture capacity of the soil, which in the case of the red volcanic loam, was increased by 17 per cent. Other tests showed that the structure of the soil had been appreciably "opened up" by the trash treatment, thus rendering it more readily absorptive of moisture and increasing the ease with which a condition of good tilth might be created and maintained.

—H.W.K., in the "Cane Growers' Quarterly Bulletin," Bureau of Sugar Experiment Stations.

Laboratory Testing of Soils.

By H. W. KERR.*

THE most direct and best method of determining the fertilizer requirements of the soil is that of the field trial. Most canegrowers are acquainted with the farm fertility trials which have been conducted throughout the sugar areas during the past six years, and the results derived therefrom have been of great benefit to the farmers participating in the work. But this method is laborious, and the number of such trials that can be carried out effectively each year is decidedly limited; in addition to his other duties, from 15 to 20 trials will ensure a busy year for one field officer.

Attempts have been made to devise laboratory soil tests whereby it may be possible to gauge correctly the plantfood deficiencies of the soil by a rapid chemical method. To establish the value of any test requires years of careful comparison between the laboratory results and actual field experience. This project has been pursued by the Bureau since the inauguration of the farm trials, and it is pleasing to report that we feel confident that we are able to give growers a reliable recommendation regarding the phosphate needs of the land, simply on the basis of our chemical test. With regard to potash, the results are not so convincing, and further investigation is required.

We are very interested at the present time in a pot test method which has been under trial in Hawaii for several years. The method consists, briefly, of filling a number of small earthenware pots with the soil under review, and adding varying amounts of plantfood, according to a pre-determined plan, to certain of the pots, after which they are sown with Sudan or Panicum grass. The yields from the respective pots at maturity are then used to calculate the requirements of the soil with respect to potash and phosphate. It is, really, a miniature "farm" trial, in which pots take the place of plots, and cane is replaced by a selected grass.

It is claimed that the results are proving of very great value in enabling reliable plantfood recommendations to be made. It is interesting to note, also, that the method gives most reliable results with respect to potash, and if Queensland experience should confirm this, we would have at our command satisfactory methods for the determination of both phosphate and potash deficiencies.

Now that a glasshouse is available at Meringa, the possibilities of the method will shortly be tested. In the near future, similar facilities will be provided at the Mackay and Bundaberg Stations, and the work will be extended to those centres if early results suggest that the method is trustworthy.

It is rather significant that in no cane country has a satisfactory test for nitrogen deficiency been formulated, excepting, of course, the direct field trial. It is generally recognised in Queensland that practically all cane soils are in need of this plantfood—particularly for ratoon crops—and farm trial results to date enable us to recommend, with a high degree of confidence, a suitable application of this plantfood under varying conditions.

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* Reprinted from the "Cane Growers' Quarterly Bulletin," through the courtesy of Dr. Kerr, Director of the Bureau of Sugar Experiment Stations.

A Fertilizer Gun.

By N. J. KING.*

THE device illustrated in the attached sketch could be used with advantage by most cane growers. The problem of top dressing a field with sulphate of ammonia cheaply and expeditiously often arises, and in the past several methods have been adopted. Most brands of sulphate of ammonia are lumpy, and unsuitable for the vibrator; but even with the English "sugar crystal" type of sulphate (which runs easily through the machine) there are times when the vibrator cannot be used. The cane may be too far advanced for a horse to be used—as in the case of a standover crop—or the ground may be too wet after rains for horse work; and it is at such a time that the grower desires to do his top dressing. Frequently, boxes or tins are utilised for hand top-dressing, and old sacks slung over the shoulder by means of a strap and with a hole in the corner are widely employed, the sulphate of ammonia being allowed to run from the hole as the worker walks along the row. These devices all serve their purpose but are, at the most, make-shifts.

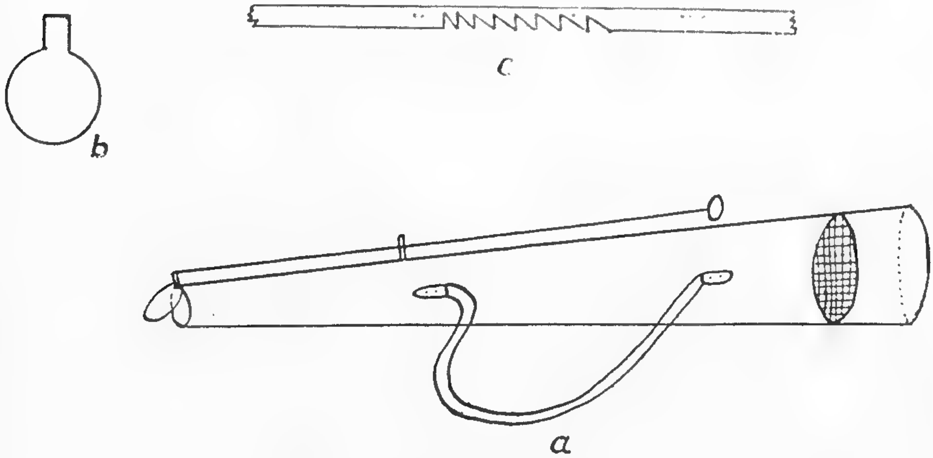

Plate 254.
Illustrating the Method of Constructing a Simple and Effective Fertilizer Gun.

In the sketch shown (Plate 254 *a*) the fertilizer gun is a conical-shaped container made of 24 gauge galvanised iron. At the smaller end is a "flap-valve" made of the same material and attached to the container by means of a hinge at the top. Plate 254 *b* shows the flap valve and it is seen that the flap is extended somewhat above the hinge. To this extension is attached a rod about ¼-inch diameter and some 18-inches to 2 feet in length running through a guide which is riveted to the gun and terminating in a handle which can be made by bending the rod to the required shape. The rod is provided with slots over portion of its length as shown in Plate 254 *c*, to allow the flap to be set in any particular position. By pulling on the handle the flap will open any required distance and, by means of the cut-away sections, will stay in that position until altered by the operator.

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* Reprinted from the current "Cane Growers' Quarterly Bulletin," through the courtesy of the Bureau of Sugar Experiment Stations.

Inside the top of the gun is set a screen made of half-inch mesh wire. The sulphate of ammonia is poured in through this screen and any lumps remaining on the wire can be rubbed through. No lid is necessary on the gun. A strap is riveted on as shown so that the device can be slung over the shoulder.

The writer is given to understand that a similar fertilizer gun (Plate 255) is used widely in Hawaii and that it can be constructed to any size depending on the desire of the operator. Generally a boy carries a gun containing 40 lbs. sulphate of ammonia, and a man some 60-70 lbs.

Plate 255.
The Fertilizer Gun Employed in Hawaii.

It can be seen that with very little practice a farmer would find at what setting the flap-valve would deliver 100, 150, or 200 lb. per acre, and could fill the gun accordingly to do so many rounds, depending on the length of the row. The device is simple and cheap to construct and could be made by any plumber.

LOADING HEAVY WEIGHTS—A POINT FOR YOUNG FARMERS.

When it is necessary on the farm to load any very heavy article in a dray, first back up to the article, then tip your dray, leaving the tail door on. Up-end or roll the load over the tail door. If it is too big, fasten it with rope to the front bar of the dray. Then take a 4-inch by 2-inch rail or a long stout pole and place through between the wheel spokes of both wheels. Standing by the tip, tell your horse to get up. The rail through the spokes will lift the load and you can fasten the top lock. One man can load almost any weight by this method.

Entomology in Hawaii.*

By R. W. MUNGOMERY.

BEFORE leaving Sydney on 3rd April, I took the opportunity of interviewing the Chief Quarantine Officer for Sydney, and arranged for the entry of the Giant American Toad, which project was to form one of my chief objectives in Hawaii. Proceeding to Fiji, where a day's stay was made, I was able to make a hurried trip to the Nausori mill, where I learned that Badila was still being severely damaged by the beetle borer, whilst the harder Malabar variety was standing up to its attack fairly well. Later, in Honolulu, I had the opportunity of meeting Mr. G. Windred, Entomologist to the C.S.R. Company, who confirmed this report, and mentioned that the control exercised by the Tachinid fly was extremely low and disappointing. Fiji disease was also seen in the fields, but by systematic roguing and the use of slightly more resistant varieties the disease was being brought under better control again.

Arriving in Honolulu on 12th April, I was met by Mr. Pemberton, Entomologist of the Hawaiian Sugar Planters' Association Experiment Station, who took me to the Experiment Station headquarters, and thereafter I was given the opportunity of studying any pest or other problem in which I was particularly interested. Most of my time was spent on the Island of Oahu, which afforded the threefold advantage of having the largest number of pests and parasites, it was furnished with a wide variety of climatic conditions, and in addition it was the headquarters of a large scientific staff, to whom I could refer for any information which I required. After two weeks in Honolulu, I travelled by Inter-island Airways, via Maui, to the island of Hawaii, landing at Upolu, and thence proceeding by car down the Hamakua coast to Hilo. Passing through this country, I was able to see cane growing under a variety of conditions, from the windy drier areas to those of heavy rainfall, whilst cane was being transported to the mills by flumes, by aerial cables carrying slings of cane, by locomotives hauling trucks as in Queensland, and by strings of waggons being hauled by Diesel tractors.

After a week at Hilo I returned to Honolulu, remaining there until my departure for Australia on 3rd June. On my return trip to Fiji I met Mr. Simmonds, Government Entomologist at Suva, who kindly took me to some native gardens where I was able to get a fresh supply of the pink sugar cane mealy bug, the host of a parasite which I was bringing back with me to Queensland.

The advantages of such a trip to a foreign country extend far beyond the mere study of an insect or animal in its natural habitat, for its proposed introduction into a new country. This, in itself, is of importance as one immediately gains a clear conception of the requirements of the problem, and this goes far towards making the introduction a success. Unless the special requirements connected with the breeding of the introduced insect or animal are fully understood, valuable shipments are liable to be lost before the necessary experience is gained.

* This report outlines the observations of Mr. Mungomery during a recent brief visit to Hawaii. His comments—which are reprinted from the current "Cane Growers' Quarterly Bulletin" through the courtesy of the Bureau of Sugar Experiment Stations—should prove of considerable interest to farmers generally.

More can be learned by a few days' observation, and by the asking of a few judicious questions, than by weeks of searching for the same information from books.

Further, the investigator is able to see varied sets of economic conditions and appreciate why a form of control which may be successful in one country may not be applicable in another. In addition, he is able to study the methods by which problems are handled elsewhere, the technique and special equipment employed in this work, and also, he is usually benefited by being able to adapt some of these devices in the pursuit of his own immediate line of investigations. Finally, the contacts made with eminent scientific workers who have already "won their spurs" in the entomological world is something that cannot be estimated in pounds, shillings, and pence. One discusses his problems with them, obtains their ideas on lines of investigations or control, and is benefited by their vast experience gained through wide travels and varied associations. In this way confidence is strengthened.

The following notes on the status of the major pests, parasites, and predators associated with cane production in Hawaii are of interest, as they are of special importance to our own Queensland industry:—

Bufo marinus.

This Giant Toad was introduced into Hawaii three years ago with the idea of its becoming a general insect feeder, rather than for the specific purpose of subjugating any one pest. Already it has bred up to enormous numbers, but several years must yet elapse before it will have reached saturation point.

Most insect parasites are active during the day time, and as these toads are mainly nocturnal feeders, it was thought that the general parasite population will suffer very little as a result of this importation, while several beetles, centipedes, caterpillars, and other species which are active at night will fall victims to the toad. This is actually proving to be the case. In places where toads are numerous, very favourable reports are constantly being received concerning the good work which they are accomplishing. (A more detailed description of the toad, its feeding habits, and its possibilities in Queensland, has already been published in the Quarterly Bulletin, July, 1935.)

Anomala Grub.

Anomala grub damage formerly occurred over a small area in the vicinity of Waipio on the Island of Oahu. Ewa and Waipahu plantations suffered the greatest losses, but during the period of my visit no grub damage was seen. Moreover, grubs were particularly scarce in land that was being planted or ploughed out, and diggings made in likely looking "grub patch" areas similarly yielded few or no grubs. This scarcity was due to a combination of causes. In the first place *Scolia manilia*, which was introduced from the Philippines many years ago, still maintains a very high degree of parasitism, and kills off large numbers of grubs. These wasps were very plentiful, and were found flying over all *Anomala*-infested fields. During last year, *Tiphia* sp., which was introduced to Hawaii 17 years ago, was first recovered in the fields, and its numbers then were fairly plentiful. More recently, *Elis* (near *pulchrina*), which was introduced from Guatemala last year, was recovered in the field, so that with the possibility of these three wasp

parasites operating against *Anomala,* wide variations in the degree of infestation should not be so marked in future. The predator, *Monocrepidius exsul,* can also be found in the red soils of this area, and lately a Guatemalan Elaterid, *Pyrophorus* sp., has also been liberated in the area to add to the array of *Anomala* enemies. Thus it will be apparent that an important parasite complex has been gradually built up around the *Anomala* grub, and what is most important, the bugbear of hyperparasites does not exist in these cases in Hawaii, so that the control that can be expected from their combined efforts should be high.

Another important controlling factor appears to be that of the arsenic treatment of infested soils. Although this practice has been in operation for only a few years, the treatment appears to have cleaned up some of the smaller patches of grub infestations, and a 300 lb. application of white arsenic per acre seems to give commercial control. It may be of interest to observe here, that is areas where up to one ton of arsenic per acre was applied to the soil, the up-take of arsenic by the cane stalks was no greater than in a block of the same crop growing on adjoining land, where no arsenic had been applied to the soil.

To prevent the possibility of *Anomala* being shipped to other islands, all new cane varieties from the Waipio substation (i.e., in the midst of the infested territory) are cut into sets, subjected to hot water treatment, and boxed in a screened *Anomala*-proof room, before being sent away by steamer.

Beetle Borer.

The beetle borer pest is much less prevalent in the Hawaiian Islands than in the parts of Queensland where it is now firmly established, and although borer is still one of the worst pests of sugar cane in Hawaii, the magnitude of its damage is very slight in comparison with that seen in some North Queensland canefields. In Hawaii, the Tachinid fly parasite exercises a very high degree of control, and is largely responsible for this reduction in borer damage. The system of cropping is an important factor in maintaining the Tachinid fly population in large numbers, crops being usually cut when from 20-24 months old. By this arrangement it will be apparent that approximately one-half of the cane is harvested each year, and at the end of the crushing season the remaining immature crops are about 12 months old (some older, and some younger, varying of course with the time of planting or harvesting). These young crops have sufficient cane developed to support a borer population as well as a corresponding fly population. In fact, the percentage of parasitism in cane of this age is usually greater than in cane 24 months old. By this means, a large supply of fly parasites is always at hand to migrate to nearby fields as soon as the borer attack commences. In this way a nice balance is maintained, and the borer pest does not gain the ascendency so easily. In North Queensland, on the other hand, practically all of the cane is harvested annually, and the only centres in which the fly is able to maintain itself are the few small sanctuaries left voluntarily by the growers, in unpermitted standover cane, in cane that is too small to harvest, or which has been left as a source of plants for the following year. The adult borer beetle lives for a long period, whilst the fly's life is a comparatively short one. Consequently, the borer is able to survive until such a time as young cane becomes available in which it can lay its eggs and commence breeding again. The fly, on the other hand, soon dies out if it cannot find

sufficient borer grubs on which to maintain itself during these unfavourable conditions; and for its increase again it is dependent on a few small colonies maintained in favourable sanctuaries or as outlined above. The lag between borer and parasite is thus often very considerable, and the borer is able to inflict severe damage before the parasite overtakes it. This is probably one of the chief reasons why borer control in Queensland is not all that could be desired. In Hawaii, the time lag between borer and parasite does not exist, and control is ever so much more satisfactory.

Another important factor is that, on the whole, cane is better grown in Hawaii than in Queensland, and therefore is not so attractive to borers; with normal growth (that is, an abundance of plant foods, water, and an absence of pests and diseases) there is very little crowding out of large stalks to cause souring, no top rot, no grub damage, and very little rat damage, all of which are important factors in encouraging borers to commence operations. Moreover, with the normal shedding of the leaf sheaths, parasites are able to operate, whereas where considerable binding of the leaf sheaths takes place, the borers protected by this matted trash are almost invariably not parasitised.* Further, Hawaii is not subject to cyclonic disturbances such as operate almost annually in North Queensland. These cyclones, with their attendant powerful winds and heavy rains, cause some cane to lodge rather badly, or to be otherwise damaged by floods. Trash then covers over the fallen cane, rendering it extremely satisfactory for borer attack, but very unsuitable for the operations of the fly parasite.

In the higher rainfall districts of Hawaii, which are reputedly the worst borer-infested localities, the two chief measures undertaken to minimise borer attack are a system of short cropping and the substitution of varieties possessing a harder rind, which are therefore more resistant to the borer. It has been found that borer control by the Tachinid fly parasite reaches a maximum when the crop is about 14 months old, after which there is a gradual decline in the percentage of parasitism, when the trash blanket becomes too thick and prevents the parasite from gaining access to the borers in the lower portion of the stalks. The plan is then to institute a system of short cropping; that is, the cane is cut at the age of 14-18 months, and by this means the borers are never able to breed up in sufficient numbers to cause really serious damage. By planting canes such as P.O.J. 36 and others which have a harder rind than, say, P.O.J. 2878, it has been possible to reduce borer damage to even smaller proportions. P.O.J. 36 has proved almost immune to borer attack. However, these canes can be grown only in restricted localities, and in recent practice some of the plantation agriculturists find it more profitable to grow the more susceptible variety P.O.J. 2878 than to continue growing P.O.J. 36. Whether borers will become cumulative, and damage still further increase in future years, will be an interesting point to watch.

Rat Damage.

Rat damage is prevalent in areas where much waste land, rock piles, and other rubbish occur, and also where cane has been abandoned

* It is thought that with the introduction of the sugar-cane mealy bug parasite, trash binding may in some instances be lessened, for the honey dew secreted by the mealy bugs often helps to make the trash cling to the cane stalk.

on account of quota restrictions. The introduced mongoose can frequently be seen running across the roads, and it is not able to keep the rat down to numbers sufficiently small to prevent serious damage occurring. Its unwelcome activities against many ground-nesting birds are thought to far outweigh any good it might do in killing a few rats. It, therefore, is not considered in a very favourable light in Hawaii.

No further intensive research on rats has been undertaken since the work of Pemberton, and the control measures advocated are much the same as those which he formulated, with the exception that thallium-coated wheat baits have almost completely replaced barium biscuit and strychnine-wheat baits. Squill has been tried, but its killing power does not always appear to be satisfactory, and further research with this compound is contemplated. In addition, it is thought that greater improvement in control could be made by determining more effective baits than wheat, and in this respect oatmeal and the germinal portion of maize seeds offer better possibilities.

Mealy Bugs.

The pink sugar-cane mealy bug is much less common than in Australia. Especially is this so in the drier parts of the Hawaiian Islands, and these are precisely the localities in Queensland where mealy bugs are often thickly clustered around the nodes of the cane. This scarcity of the mealy bug is due to the operations of a small parasitic wasp, several of which are able to mature in the one mealy bug. A consignment of these wasps has been brought back for colonisation in Queensland canefields.

Army Worms.

Two species of "army worm" are occasionally responsible for considerable damage to young cane, and both of these species are responsible for similar injury in Queensland canefields. *Spodoptera mauritia* appears to give most trouble, and I witnessed damaged portions of fields on the Island of Oahu, where young plant cane was completely stripped of its leaves. Similar damage was seen on Hawaii, and reports from Maui indicated that the same severe damage was occurring there. This damage occurs despite a vast array of parasites at work against these insects, but such outbreaks occur usually when some climatic condition has upset the happy balance existing between host and parasites, enabling the pest to increase suddenly.

Eggs are usually laid on the young cane leaves, and the young caterpillars on hatching out drop by thin threads to the nut-grass below, where they feed for some time, and later migrate to the young cane as they grow bigger. Several plantations follow the practice of having labourers clip these egg masses from the cane leaves and destroy them, but such a procedure is of doubtful value, as it greatly limits the activities of a tiny wasp parasite of the egg, and it only requires that a few egg masses be overlooked to furnish an ample supply of caterpillars which will infest the cane to such an extent as to cause this damage. These caterpillars do not, as a rule,, hide during the day under trash and other debris, like those of the Queensland species, *Cirphis unipuncta*, but feed openly on the cane leaves and in the spindle. Therefore, when artificial control measures are resorted to, a mixture of one part of arsenic to six parts of finely powdered raw rock phosphate is dusted over the entire area, the application being made at the rate of 100-150 lb. per acre. *Cirphis unipuncta* sometimes causes damage in some of the wetter

districts, and by virtue of the fact that the usual army worm bait disintegrates rather rapidly under heavy rainfall conditions, the following bait has been evolved, and has proven much more suitable in these wet districts:—

10 lb. bagasse 20 lb. molasses 1 lb. white arsenic ½ lb. casein (Kayso) 2 qt. water.	The arsenic is stirred into the molasses thoroughly before mixing in other ingredients.

Biological Control.

Biological control in Hawaii has given outstanding results. Especially can this be claimed in respect of sugar-cane entomology, and the high degree of control obtained by means of introduced parasites has become a classical example which is frequently quoted to demonstrate the benefits to be derived from this form of control. The chief reasons for these successes are that Hawaii, in the first place, has a very limited insect fauna, and, in the second place most of the serious pests have been introduced from other countries, and are not native to the Hawaiian Islands. When, therefore, a new pest has gained entry into Hawaii and threatens serious damage, entomologists have gone to the country of origin of the pest, and there sought out and introduced the most effective parasites. These searches have frequently taken them to fever-stricken and inaccessible areas, and much ingenuity was required in transporting the parasites back to Hawaii successfully. These difficulties have been overcome one by one, with the result that most of the formerly important pests (at least so far as sugar-cane is concerned) have been reduced to the status of comparatively unimportant ones. Such a state of affairs has been rendered possible by the fact that these introduced parasites have had a clear field in which to operate, and have not been hindered by the action of hyperparasites. This partly serves to explain why we, in Australia, cannot hope for the same high degree of success as is experienced in Hawaii. In the first place, we are dealing mostly with native pests which formerly fed on the leaves, stalks, and roots of native grasses, but which have now adopted cane as an equally, if not more suitable, host plant. In the second place, the parasite complex of our pests is very large and much involved. If further parasites were introduced, they would in most instances be necessarily so closely related to those already occurring in Australia as to render them liable to severe attack from hyperparasites. They would thus become ineffective as controlling factors of any great magnitude.

The control of the sugar-cane leaf hopper by parasites introduced from Australia, Fiji, and China, the control of the *Anomala* grub by a digger wasp, introduced from the Philippines, and the control of the beetle borer by the New Guinea Tachinid fly are some of the outstanding successes which the entomologists of the H.S.P.A. Experiment Station had to their credit many years ago. But they are not resting on their laurels; rather are they putting forth every effort to make parasite control even more effective. Within recent years the *Scelionid* parasite of grasshopper eggs has been successfully established, also the pink sugar cane mealy bug parasite, whilst during last year several new parasites and predators were imported from Guatemala to assist further in the control of the *Anomala* grub. One of these has already become established, whilst others have been liberated in *Anomala*-infested fields.

These many successes are apt to create the impression that introductions of parasites into Hawaii have been an easy matter. Actually, many parasites have been introduced, bred up to large numbers under laboratory conditions, liberated in the fields, and have afterwards failed to become established. In other cases, such as with the beetle borer, intensive search in many of the East Indian Islands has failed to bring to light a parasite likely to prove more successful than, or add to the degree of control already being exercised by, the New Guinea Tachinid fly. In some places other parasites were located, but they were either comparatively rare in occurrence, or they were suited more for the wet tropical jungles, where allied borers occur.

Disease Transmission Work.

Work was in progress in Hawaii to test the possibility of insect transmission of leaf-scald disease. Cane leaf hopper, cane aphis, and the grasshopper *Oxya chinensis* were being tested, but, although these tests had been in progress for more than a year, no case of transmission had been recorded.

An interesting sight which came under my notice was that of lightning injury to Yellow Caledonia. Where the lightning had struck the ground there was a circular area of about 10 yards in diameter where the cane had been damaged. Some of the cane stalks were dead, and showed considerable charring, whilst others had a prolific development of side shoots. Other stalks which came in contact with a strand of stout fencing wire used to prevent lodging had suffered similar injury for a distance of the entire length of the wire, some 1,200 feet. Certain of these canes displayed symptoms similar to leaf-scald, and later definite leaf-scald symptoms were found in a few stalks. This occurrence has raised the question of the probable masking of symptoms or the latency of the disease in this variety under the normal conditions of growth near Hilo, and the possibility of lightning injury or other serious growth check serving to bring out the typical leaf-scald symptoms.

Chlorotic streak was also seen to occur in some of the wetter localities, such as at Olaa plantation, on Hawaii, and at Kailua, on Oahu. In this latter area, many new seedling canes are being raised and tested annually; and the percentage of infection in these new varieties is very high, indicating a very rapid rate of spread.

No work is being done on this disease so far as attempting to determine possible insect vectors is concerned. The canes undergo a hot water treatment at 52°C. for 20 minutes prior to being sent to other parts of the islands.

Acknowledgment.

I wish to tender my sincere thanks to those in Queensland who made my trip to Hawaii possible, and to those in Hawaii who made my sojourn there so interesting and delightful. To the entomologists of the Hawaiian Sugar Planters' Association Experiment Station I owe a deep debt of gratitude, and particularly so to Mr. C. E. Pemberton, who not only made himself responsible for showing me the detailed activities connected with pest control in Hawaii, but also saw to my personal welfare whilst I was incapacitated for a time through sudden illness.

Frost Damage in Cane.

By N. J. KING.*

IN the Bundaberg district and those areas further south the incidence and severity of frosts become factors of importance in cane production. The winter of 1932 and of the present year provide a drastic example of what damage is likely to ensue from heavy frosts. It is an established fact that on frosty nights the lowest temperatures exist at the ground level, or in close proximity thereto. Cold air settles to the ground and therefore the lowest temperatures are recorded immediately above the soil—what is generally termed the "grass reading." As night approaches and the surface of the earth begins to cool, heat is radiated from the soil into the atmosphere. The soil moisture removed by this radiated heat condenses on contact with the cooler air and is deposited as dew. On an open field—under bare fallow—the radiated heat is quickly lost in the atmosphere and any drop in temperature of the air causes a settling of the colder atmospherical strata to the soil level.

In a field of tall cane, however, the cane tops act as a blanket, preventing to a large extent the radiation and consequent loss of heat from the soil. The atmosphere within the cane block keeps warmer and moister than the bare fallow block and is therefore subject to a smaller drop in temperature. Added to this is the fact that transpiration processes in the plant itself produce a certain amount of heat and this heat assists in lessening the effects of any serious drop in temperature in the surrounding atmosphere.

With a view to determining the effect of growing cane on atmospheric temperatures it was decided during 1933 to record temperatures each night on the Bundaberg Sugar Experiment Station, at heights varying from ground level to 7 feet 6 inches. Six thermometers of the maximum-minimum type were attached to a pole, the first at ground level and then at 18-inch intervals so that the highest was at 7 feet 6 inches. Temperatures were recorded each morning. The thermometers were first placed on a bare fallow block and the following are some of the figures obtained:—

Date.	Height.					
	0 in.	18 in.	36 in.	54 in.	72 in.	90 in.
1933						
28th April	55	57	65	66	65	64
3rd May	55	57	57	56	56	57
15th May	55	55	55	54	54	54
17th May	48	49	50	50	50	50
20th May	46	47	49	49	49	50
24th May	54	57	58	55	54	54
27th May	47	49	51	51	52	53
1st June	36	36	38	38	39	40

Two outstanding points in the above table are (1) the influence of still nights, and (2) the effect of a shower of rain. On April 28 was recorded a very still night with no breeze; the difference of 11 degrees F.

* In the "Cane Growers' Quarterly Bulletin" for October, published by the Bureau of Sugar Experiment Stations.

between the ground level and the 4 feet 6 inch level is really remarkable, illustrating in no uncertain manner the concentration of the cold air at the lower levels. On 15th May some 13 points of rain were registered and it is seen that on that night the lower level thermometer gave a higher minimum reading than the instruments higher up the pole. This latter observation supports the contention that crops on moist soils are less likely to be frosted than those on dry soils. Wet soils conduct heat better than do dry ones and consequently the radiation loss is more rapidly compensated for by conduction of heat from the subsoil; also under moist conditions the lower atmosphere is highly charged with moisture and the greater condensation produces a ground mist or fog which acts as a protective covering against radiation loss.

To obtain definite figures to illustrate and confirm this contention the thermometers were removed to Bingera Plantation and set up on a pole in an irrigated block so that the lowest thermometer was 12 inches from the ground and the highest 10 feet. A member of the staff of Messrs. Gibson and Howes co-operated in taking daily readings of the thermometers. The following are some of the figures recorded:—

Date.	Height.					
	12 in.	24 in.	48 in.	72 in.	96 in.	120 in.
1933.						
8th June	53	53	54	51	53	52
10th June	52	51	54	48	49	49
17th June	53	53	52	50	50	51
21st June	42	41	39	37	39	39
26th June	35	35	33	32	32	33
27th June	36	36	33	32	32	33

It is noticeable that the temperatures below six feet (inside the cane) are notably higher than above the cane, and that a definite drop occurs at about the six-foot level. This illustrates the fact that the cold air settles on the cane tops as it did on the ground in the bare fallow experiment. Radiated heat from the soil, and heat of transpiration from the cane keep the temperature there above normal atmospheric figures.

The thermometers were removed once more and divided into two lots of three each. One set was placed as before within a cane block, and the other outside the block where normal conditions prevailed.

Date.	In Cane Block.			Outside Cane Block.		
	Height.			Height.		
	2 ft.	6 ft.	10 ft.	2 ft.	6 ft.	10 ft.
1933.						
26th July	51	52	49	48	53	54
27th July	45	44	41	43	44	46
28th July	45	43	42	40	43	44
1st August	43	41	39	42	42	43
5th August	39	37	35	37	38	39

These figures merely confirm what has gone before.

The difference between frost and no frost may be a matter of one or two degrees of temperature and if moist soil and a tall cane crop can make this difference of two degrees, light frosts may thus be avoided. It is evident therefore that on lands of similar topography and growing the same variety, the irrigated crop is in less danger of frost damage than the non-irrigated one.

As the result of a few initial experiments it is thought—though by no means proved—that a trash cover on the ground surface may have a somewhat similar effect. During the winter of 1935 a soil recording thermometer was utilised to obtain some soil temperature readings. The instrument carried two thermometers and a complete record of variation in temperature was obtained on the chart. One thermometer was buried under 4 inches of soil and the other under 4 inches of soil plus the trash from the previous crop, which had been conserved in alternate interspaces. The accompanying diagram (Fig. 28) is copied from the recorder chart and shows the temperature of each thermometer at hourly intervals. Starting at 9 a.m., it is seen that the trash covered soil is warmer by two degrees than the bare soil. It remains warmer till 12.30 p.m. when the sun's rays heat up the bare soil, reaching a maximum at 5 p.m. at which time it is warmer by four degrees than the trash covered soil. At about 1 a.m., however, the bare soil becomes cooler than the trash covered, becoming some three degrees cooler by 9 a.m., and then begins to warm up again.

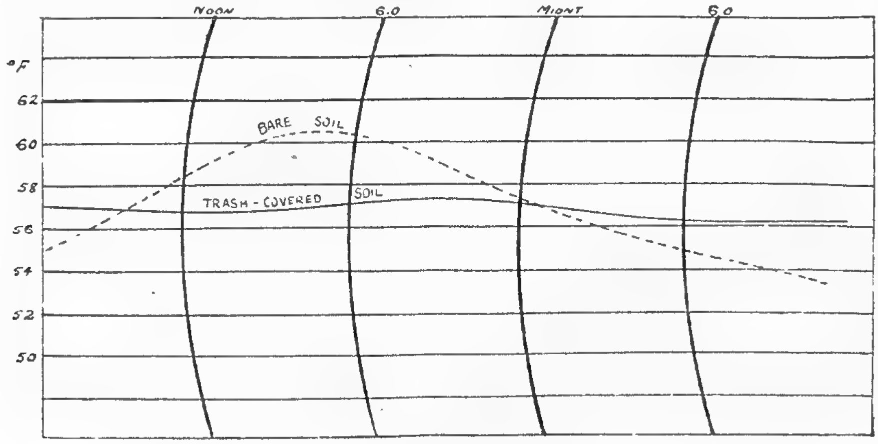


PLATE 256.

Illustrating the Daily Variation in Soil Temperature with Bare and Trash-covered Land.

The trash here is obviously acting as an insulating blanket preventing rapid radiation of heat during the night, and it may be supposed that this effect is similar to that of a wet soil. In fact, the soil under the trash was moister than the bare soil, and the effect may be due to moisture alone. No conclusions can be drawn at this stage, but as the opportunity arises further work will be carried out.

The lighting of smoke fires or "smudges" has often been mooted in South Queensland as a frost-preventive measure, and has been used extensively in other parts of the world (notably California) for frost prevention with fruit crops. Some years ago a very complete investigation into the value of smudges showed conclusively, in

California, that the smoke had no appreciable effect in preventing frost, and that their only value was the warmth given off by the fires themselves. An orchard entirely surrounded by smoke fires enveloping all the trees in a blanket of smoke did not have its atmosphereic temperature raised by 1 degree above that of the surrounding orchards. Experiments at the Mackay Experiment Station on a very small block of cane were favourable, but experiments on the Northern Rivers of New South Wales, on a 10-acre block, were a failure.

It may be pointed out that the degree of cold during a frost is not a true criterion of the damage one may expect. A thermometer reading of 27° (5° of frost) may only mean that the temperature reached that figure for an instant; and the total time that the thermometer registered less than 32° may have been only half an hour. Much more damage would be done by a frost when the thermometer fell only to 30° (2° of frost) but remained there for eight or ten hours.

Severity of Frost Damage.

Under the most severe frost conditions in Queensland, such as were experienced at Wallaville this year, the leaves, growing point, and buds are all killed. The first indication of frost damage is revealed by slicing a stick of cane vertically, when it will be found that a sodden area occurs just above the growing point. This area turns brown after some forty-eight hours, when the "heart" can be pulled out of the stick. If the growing point be killed but not the eyes of the stick, side-shooting will proceed. Under the least severe conditions the leaves only are affected, assuming a sun-scorched appearance. The latter condition imposes a check on growth, but as soon as warm weather ensues new leaves develop.

Frost Resistant Varieties.

In a series of experiments recently carried out by the Colonial Sugar Refining Company in the Tweed River district, it has been recorded that there are four degrees of resistance to frost injury, depending on the variety. These are listed as follows:—

1. *Resistant in both leaf and stalk*—Co. 281, Co. 290, P.O.J. 979, P.O.J. 2379.
2. *Susceptible to leaf injury but of fair to good stalk resistance*—Q. 813, Badila, 26 C. 148, P.O.J. 100.
3. *Susceptible to stalk injury but of good leaf resistance*—P.O.J. 2364, P.O.J. 2727, P.O.J. 2878, P.O.J. 2883.
4. *Susceptible to injury in both leaf and stalk*—P.O.J. 2725, Korpi, Oramboo, Nanemo, S.C. 12/4, B.H. 10/12.

UTILIZING MAIZE COBS.

Cob charcoal is greatly relished by pigs, and where maize cobs are available they may easily be converted into valuable feed in the following way:—Dig a hole about 5 ft. deep, 5 ft. in diameter, and with slightly sloping sides. Start a fire with a few cobs, and keep adding cobs as fast as they ignite. When the whole mass is glowing red, have a couple of barrels of water handy, in which 40 lb. salt has been dissolved, and pour this water over the whole mass. Then cover the top of the pit with a large piece of sheet iron, placing some earth around the edges to exclude all air. The following morning there will be a valuable lot of charcoal, which the pigs will turn to excellent account.—"The Australasian."

THE November rainfall was generally under average throughout the State, only light storms being experienced early in the month. The subsequent hot dry westerly winds have dried out the pastures, and had an adverse effect on lucerne and all young growing crops. As an instance of the prevailing conditions, grass fires were experienced on portions of the Darling Downs, but owing to the strenuous efforts of the fire fighters, the conflagration did not extend to the wheat lands where crops were fast ripening.

Wheat.

Crops have ripened off rapidly, and the harvest has proceeded under favourable conditions without the delays often experienced as a result of early storms. Some high yields are being garnered, one of the most noteworthy reported being that from a small area at Moola in the Dalby district, where Messrs. James Hope and Son harvested 168 bags of Flora wheat from 7 acres, or 72 bushels per acre. From a total of 70 acres, of which the 7 acres formed a part, 970 bags were received, a yield of more than 41 bushels per acre. Like many Downs farmers, Mr. Hope, senr., is a dairyman, and wheat is chiefly grown on his property for fodder purposes.

The Queensland Government has passed the necessary legislation to give effect to the Commonwealth Wheat Stabilisation Scheme, but owing to the opposition being met with in other States, it is very doubtful whether the scheme can be applied to the present season's harvest, in the event of which the flour tax may be reimposed for an indefinite period. The scheme provides for the payment of a home consumption price of 4s. 9d. per bushel, and the equalisation of all home and export sales throughout Australia, in a similar manner to the plan now successfully operating in the dairying industry. Although Queensland as a non-exporting State does not stand to make any substantial gain from such a scheme, in view of the fact that approximately 75 per cent. of Australian wheat is exported, the principles of organised marketing must be impartially applied.

PLATE 257.

NEW WING, AGRICULTURE AND STOCK BUILDING, WILLIAM STREET, BRISBANE.

The wheatgrowers can rest assured that the Queensland Wheat Board will watch their interests closely, and that the best possible arrangement will be made.

Tobacco.

A comprehensive series of experiments is again being undertaken during the present season, in the Mareeba, Dimbulah, Townsville, Mackay, Bowen, Rockhampton, and south-western districts, embracing seed selection and propagation, fertilizer, variety, and green manurial trials. Plots have also been initiated in the Gayndah district, where soil conditions appear suitable, and where growers have access to water for irrigation purposes. Tobacco-growing is a new venture for farmers in this district, and the progress of the plots will be watched with interest. At the time of writing, weather conditions remain dry in the northern areas, so that generally planting out is delayed. Many growers in the Dimbulah area have installed pumping plants, and are planting out and watering by hand. Good progress is being made by the irrigated crops in the Mareeba district, especially where thorough cultivation is being practiced as against repeated applications of water with little or no cultvation. In the Texas, Yelarbon, and Inglewood areas, early seasonal conditions were more satisfactory, and plantings were practically finished by the end of November. Growers are maintaining their interest in tobacco cultivation, and although too early for an estimate of the total acreage, it is expected that the area under crop will exceed that of the previous season.

An officer of the Department of Agriculture and Stock is now in Sydney studying tobacco grading and general handling with one of the largest Australian tobacco manufacturing companies. Valuable information will be obtained, which will be passed on to the growers in due course.

Sugar.

The Bureau of Sugar Experiment Stations reports (25-11-35) :—During the month several of the northern mills completed their crushing and most mills will have finished for the year by early December. A re-estimate of the crop prepared in late October suggests that the sugar crop will be rather in excess of the earlier figures.

Growing conditions for the month have been quite satisfactory in the far northern area, and the condition of the young cane is excellent. In the areas from the Burdekin south, rain is badly needed to ensure a continuation of growth. Should the dry conditions persist for another fortnight the growth check will be most serious.

General.

The *Cactoblastis cactorum* continues its work among the secondary growths of prickly-pear on western lands, it being claimed that no extensive belts of dense regrowth remain. This remarkable insect has, therefore, overcome the primary pear and practically all secondary growth within a period of nine years. Other insects are to be tried out against the tiger pear, which has so far shown greater resistance to the Cactoblastis. In view of the increased interest being shown in grasses and pasture improvement by farmers and graziers throughout the State, the articles appearing in this and previous issues of the "Queensland Agricultural Journal" are particularly opportune. In this connection

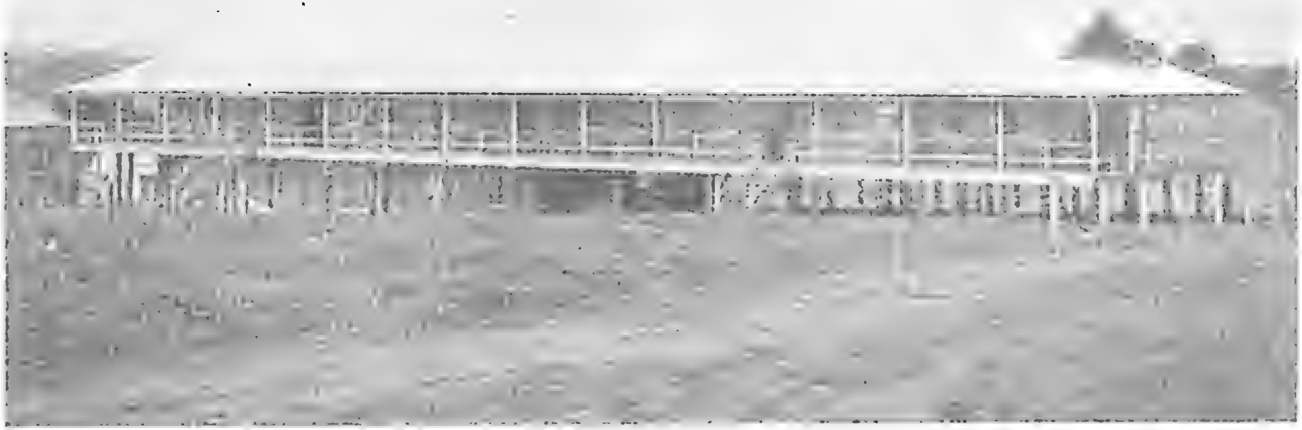


PLATE 258.

NEW DORMITORY, ST. LUCIA FARM SCHOOL.

At the Farm School, the rudiments of agriculture and animal husbandry are taught thoroughly. At the end of a six months' course, for which no charge is made, St. Lucia trainees are guaranteed a job with a good farmer. The demand for trained youths continues greater than the number available for farm employment.

New Zealand has set a high standard in pasture management, and although climatic conditions differ greatly from those obtaining in Queensland, the principles underlying their work can be applied with advantage.

Heavy supplies of potatoes have been reaching the local markets, reports indicating that many consignments are immature, unsatisfactorily graded, and infested with moth, resulting in depressed values. Prime-quality tubers continue to realise good prices, but owing to keen southern competition, local growers cannot expect good prices unless grading is thoroughly carried out.

Maize has increased in price, up to 4s. 8d. per bushel being paid. The rates for fodder have also improved, probably owing to the hot dry weather recently experienced causing the wilting of crops in the main supplying districts.

New Form of Rat Bait

ONE of the most interesting papers presented to agriculturalists at the recent International Technologists' Conference in Brisbane, dealt with the rat pest in cane areas, and was prepared by Mr. K. Gard, of Macknade. It sets out the results of extensive researches on the habits of the various species of rat which damage cane in Queensland, and concludes with a discussion of control measures which have been tried out in the Ingham district.

Of particular interest to canegrowers is the description of a new form of bait preparation which was devised by Mr. M. S. Barnett, of the Colonial Sugar Refining Company. This bait seems to combine all the desirable features of a highly satisfactory rat poison, and would appear to possess advantages over all other preparations which have been employed to date. The essential features are a paper container, rolled in the form of a cigarette, which is saturated with raw linseed oil, plugged at both ends with hard paraffin wax, and containing sufficient poisoned wheat to kill a fully grown rat.

It has been shown that linseed oil is an excellent attractant for the rat, while the poison cylinders (or "poisils") as prepared are rendered perfectly waterproof by the oil and wax treatment. The poisils are marketed in the form of a compact "wheel" which contains 600 or more baits; the wheel is held together by the paraffin coating top and bottom, but can readily be broken up by hand and the individual baits removed as required.

The paper concludes by stating that "this form of bait, prepared preferably with thallium sulphate, recommends itself as the most suitable one devised up to the present, being safe, handy, cheap, durable and effective." It was the opinion of the overseas entomologists attending the Conference that this method of bait preparation appeared destined to change the entire aspect of rat control, and marked one of the most important advances in this field in recent times.

—H.W.K., in the "Cane Growers' Quarterly Bulletin," Bureau of Sugar Experiment Stations.

APPLE PACKING FOR EXPORT AND HOME MARKETS.

By JAS. H. GREGORY, Instructor in Fruit Packing.

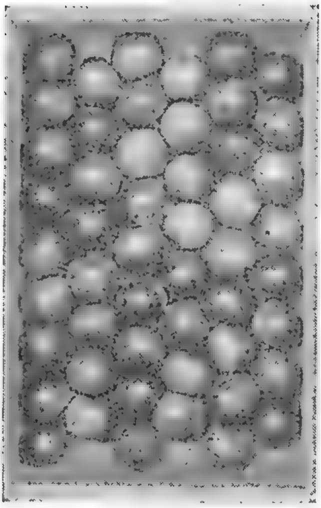
Part III.

(*Continued from August*, 1935.)

OWING to repeated requests, the angled type of packing the standard case is herewith illustrated in full. It is suggested that readers compare these illustrations with those of the standard packs previously published. The difference between the packs is the number of layers in the pack. Straight 3-3 packs are packed with open pockets, and contain six layers. The angled packs illustrated have closed pockets, and contain five layers. Straight 3-2 packs contain five layers, angled 3-2 packs four layers. The angled packs are of assistance when packing hardwood cases which do not permit a bulge to be placed upon the top and bottom of the case when packed. These packs are also advantageous when packing unwrapped apples. There is a risk, when using angled packs, of some of the fruit becoming stalk-marked, but care whilst packing will overcome this. The stalks should be placed so that they touch the cheeks of adjoining apples on the side nearest the packer. If this is done, the puncturing of the skin by the application of pressure to the layer whilst finishing it off is prevented. It is only with long-stalked varieties that there is any risk. Observations have shown that most stalk-marking takes place in the picking bags and on the sizing machines before packing.

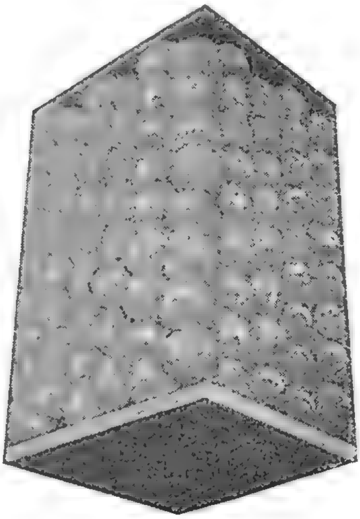
3-3 Packs. Five Layers.

First Layer.



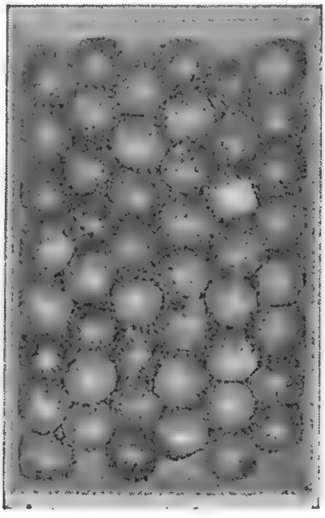
Finished Case.

Top. Side.



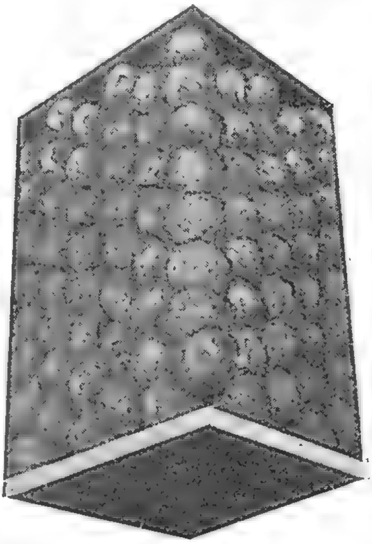
3-3 Pack, 9 x 8 Layer Count. Five Layers, 255 Count.

First Layer.



Finished Case.

Top. Side.

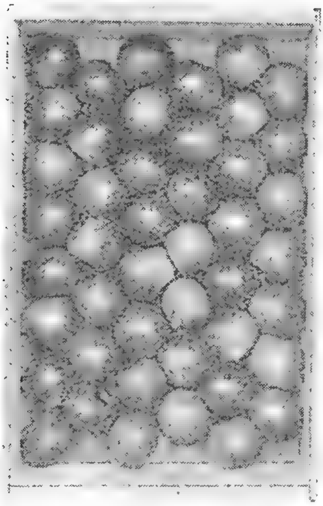


3-3 Pack, 8 x 8 Layer Count. Five Layers, 240 Count.

Plate 259.

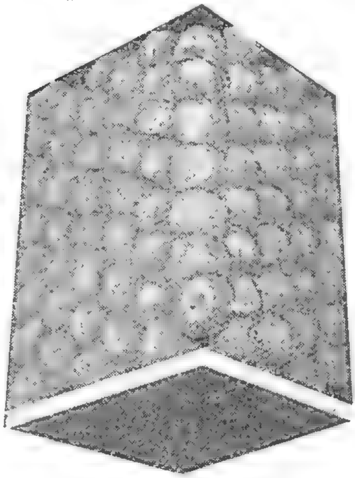
3-3 Packs. Five Layers.

First Layer.



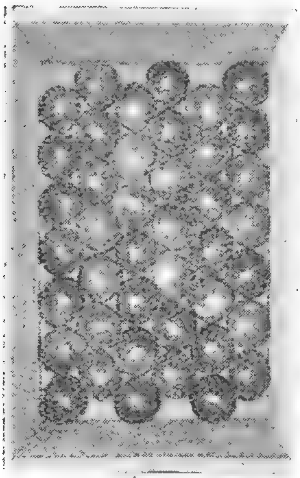
Finished Case.

Top. Side.



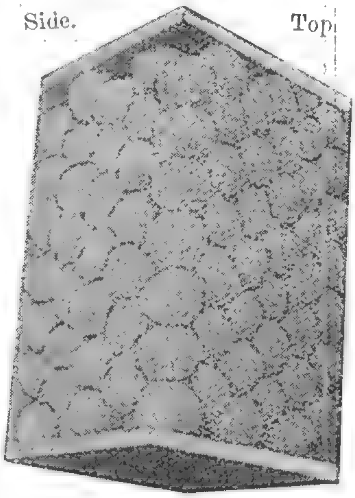
3-3 Pack, 8 x 7 Layer Count. Five Layers, 225 Count.

First Layer.



Finished Case.

Side. Top.

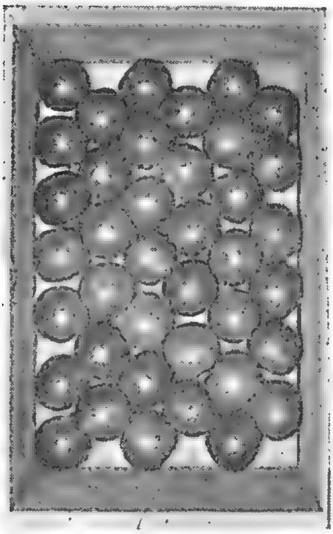


3-3 Pack, 7 x 7 Layer Count. Five Layers, 210 Count.

PLATE 260.

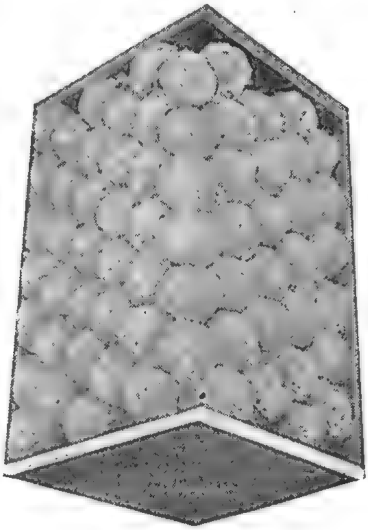
3-3 Packs. Five Layers.

First Layer.



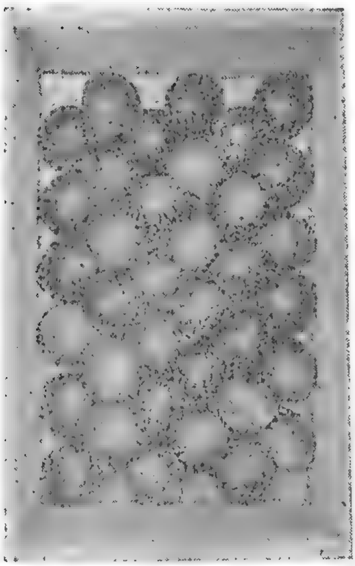
Finished Case.

Top. Side.



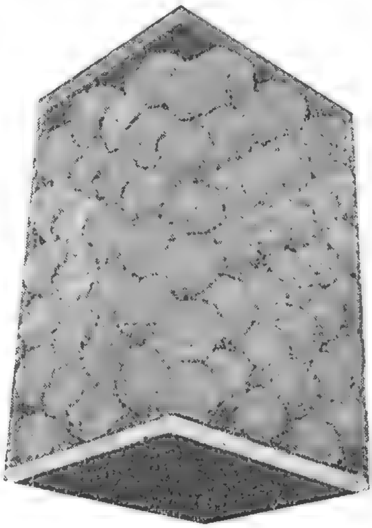
3-3 Pack, 7 x 6 Layer Count. Five Layers, 195 Count.

First Layer.



Finished Case.

Side. Top.

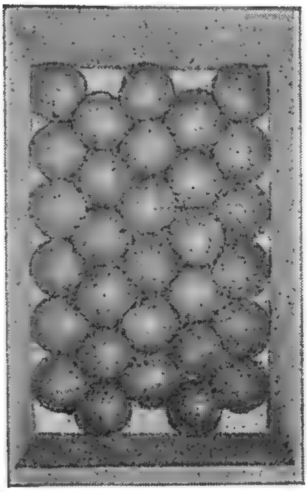


3-3 Pack, 6 x 6 Layer Count. Five Layers, 180 Count.

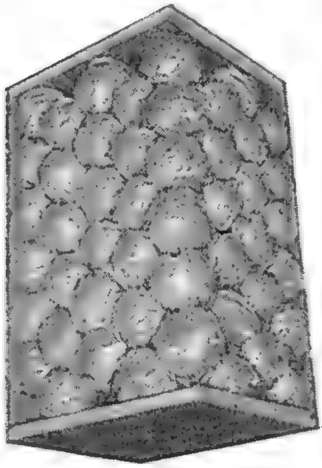
PLATE 261.

3-2 Packs. Four Layers.

First Layer.

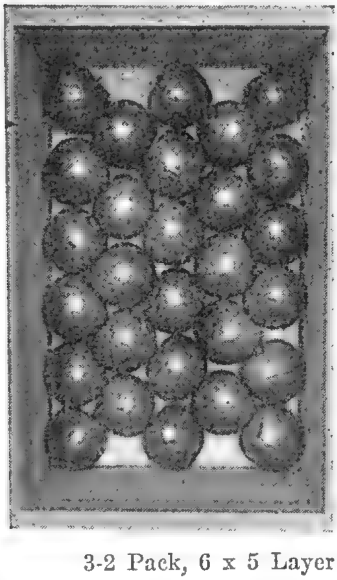


Finished Case.
Top. Side.

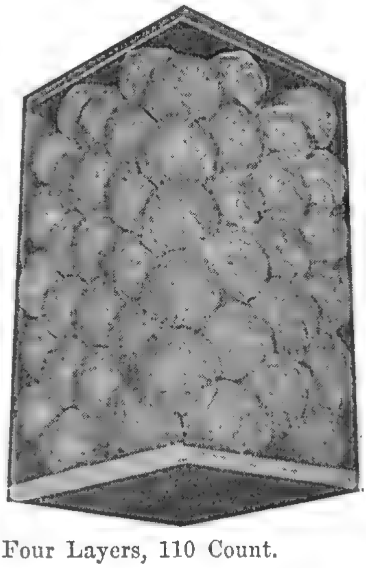


3-2 Pack, 6 x 6 Layer Count. Four Layers, 120 Count.

First Layer.



Finished Case.
Top. Side.

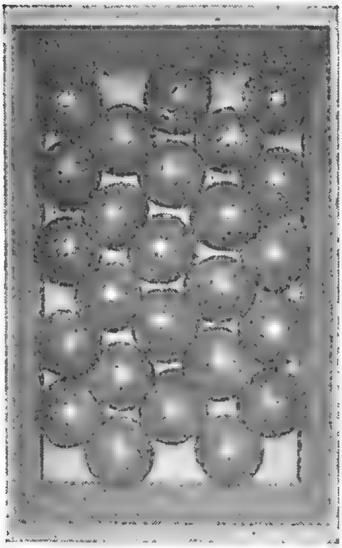


3-2 Pack, 6 x 5 Layer Count. Four Layers, 110 Count.

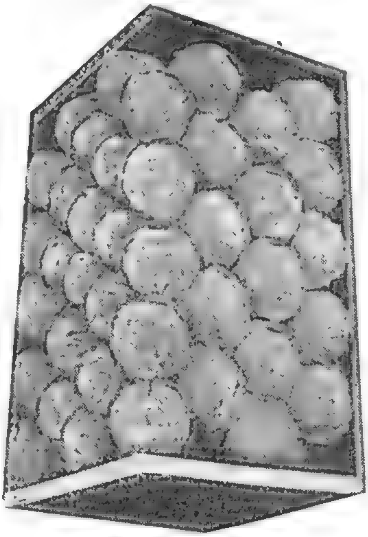
PLATE 262.

3-2 Packs. Four Layers.

First Layer.

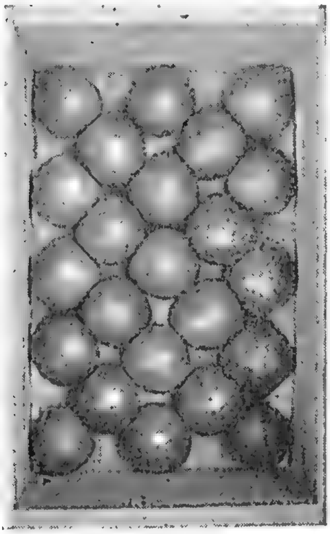


Finished Case.
Top. Side.

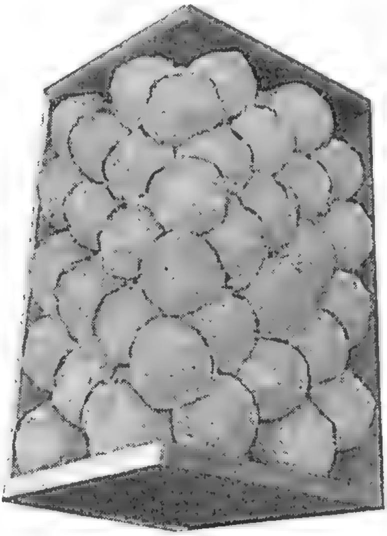


3-2 Pack, 5 x 5 Layer Count. Four Layers, 100 Count.

First Layer.



Finished Case.
Side. Top.

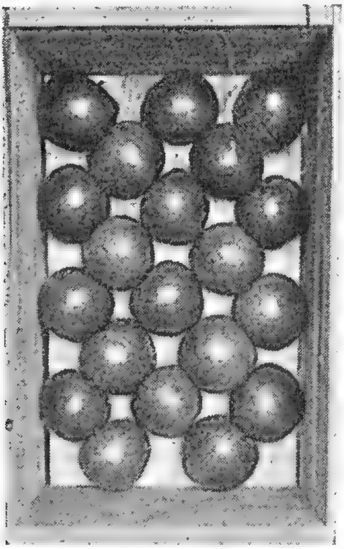


3-2 Pack, 5 x 4 Layer Count. Four Layers, 90 Count.

Plate 263.

3-2 Packs. Four Layers.

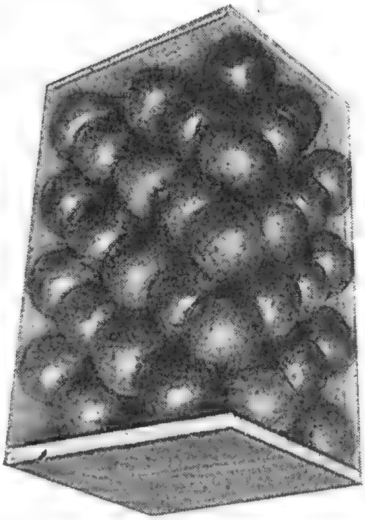
First Layer.



3-2 Pack, 4 x 4 Layer Count.

Finished Case.

Top. Side.



Four Layers, 80 Count.

Plate 264.

WATER-CORE IN APPLES.

J. H. GREGORY, Instructor in Fruit Packing.

As there have been many conflicting opinions expressed with regard to the effects of cold storage on water-core, a test was carried out by storing specimens of the following varieties of apples:—Granny Smith, Delicious, and Dunns.

Storage.

Specimens of these varieties of apples for the test were obtained in the Stanthorpe district. Some were placed in common storage in a cool place beneath a house at Stanthorpe on the 28th March, 1935, while the remainder was placed in cold storage at Messrs. Birt's Cold Stores, Brisbane, on the 29th March, 1935. In each case samples of unaffected good-quality fruit were enclosed as checks.

Temperatures.

The fruit held in common storage beneath the house was kept for a period of twenty-one days at temperatures varying up to a maximum of 76 degrees Fahr. The cold-stored fruit remained in storage at a temperature of from 34 to 35 degrees Fahr. until the 31st August, 1935—a period of twenty-two weeks and a day.

Condition of Fruit at Commencement of Test.

Specimens of fruit examined before storage showed the water-core sections, on being cut, to be transparent and practically colourless. With the exception of the traces of water-core, which were discernible

beneath the skin, the skin colour in each case was natural to the variety. There was no trace of greasiness on the skins of the Granny Smiths and Delicious, but the Dunns showed signs of this, possibly owing to the lateness of the season.

Condition of Fruit at Expiration of Test.

The following observations were made after storage under both conditions:—

Fruit Held in Common Storage for 21 Days.

Variety.	Results.
Dunns	Sound specimens.—The skin of the fruit became yellow in colour and greasy, but the flesh remained white and juicy, with a fair flavour for the variety. Water-core specimens.—Skin colour changed to yellow, and the fruit became dull in appearance. When cut, the water-core sections appeared spongy, and were brown in appearance and dry in texture, also insipid in flavour, with a slight taste of mustiness. The fruit gave the impression that it was on the verge of complete breakdown.
Delicious	Sound specimens.—Skins were slightly greasy, and the ground colour was a deeper yellow than at the start of the storage period. Flesh was clear, with fair flavour, but slightly "mealy" in texture. Water-core specimens.—Skins slightly greasy, but dull and darkened in appearance; flesh dry and "mealy," with a brownish appearance, tasteless and unattractive.
Granny Smith ..	Sound specimens.—Were in excellent condition. Skins showed signs of becoming greasy. Colour was practically unchanged; the fruit was juicy and the flesh full-flavoured. Slightly-affected specimens.—Signs of water-core were practically gone, and the condition of the fruit was comparable with that of the sound specimens. Badly-affected specimens.—Showed no change in the incidence of the trouble; the skin was dull, with no apparent change in the colour, and showed slight traces of greasiness.

Fruit Held in Cold Storage (35° F.) for 155 *Days.*

Variety.	Results.
Dunns	Sound specimens.—Yellow in colour, firm, juicy; skin greasy; flesh when cut of attractive appearance. Water-core specimens.—Skin dull yellow to brownish yellow in colour and greasy; flesh "mealy," dull, brownish in colour, soft, and unattractive in flavour.
Delicious	Sound specimens.—In good condition, bright and juicy, but giving the impression that they had been stored for a sufficiently long period. Flesh was white and of good flavour, and in large specimens "mealy" in texture. Water-core specimens.—Skin dull in appearance and unattractive; flesh soft, brown, and flavourless; fruit dead in character.
Granny Smith ..	Sound specimens.—Were in excellent condition, with good flavour, bright appearance, and juicy. Water-core specimens.—Apparently no improvement in the skin of even the slightly-affected specimens, although the actual water-core affection had decreased greatly, and where originally only slightly affected, had completely disappeared. Badly-affected apples were showing a brownish development in the flesh, with a dry texture and poor flavour compared with the sound fruit.

From these observations it will be seen that either cold storage or common storage has not any great control towards eliminating water-core after the fruit has been harvested. The best course would appear to be to leave the fruit hang on the trees and so give it a chance to grow out of the trouble. Field observations have shown that fruit not unduly affected will grow out of the trouble in from two to three weeks under normal growing conditions. It is hoped to conduct further tests with various varieties during the next Stanthorpe season.

PACKING BANANAS FOR MARKET.

By JAS. H. GREGORY, Instructor in Fruit Packing.

(*Continued from page* 621, *Vol. XLI., Part* 5—*November,* 1935.)

NOTWITHSTANDING the many packs described and the apparent disadvantages the " full-hand " pack shows, there is no doubt that when studying all the phases of marketing this and part "hand" or "cluster" packs are the best. The incidence of disease is lessened and the display value to the shopkeeper greatly increased. Inquiry at retailers confirms this. Most people agree that a nicely ripened hand of bananas has more appeal in a shop window than a heap of singles. Part hands or clusters have also the same advantage over single packs. Where growers pack in singles, one wonders why the vertical two pack has not been used more, as it is a most attractive-looking pack and is quite easy to do.

Summarised, the salient points of banana-packing are as follows:—

Care in harvesting from the stool and carting to the packing house to avoid damage to the fruit.

Care whilst removing the hands from the bunch.

Care whilst breaking the hands into part hands or singles, so that the shanks are not wrenched.

In summer cool the fruit and keep cool; in winter do not permit the bunches to become chilled.

Oversize your fruit when packing in preference to undersizing.

Pack to a natural bulge low at the ends of the case and high in the centre.

Do not pack diseased or malformed fruit.

Clean up the packing shed and implements after despatching each consignment.

PACKING-HOUSE HYGIENE.

This is most important if the risk of disease is to be reduced. Most transit troubles are caused through fungal infections. If fruit is allowed to lie about the packing shed and decay, the risk of infecting

Finished Cases of Bananas.

"Sixes."

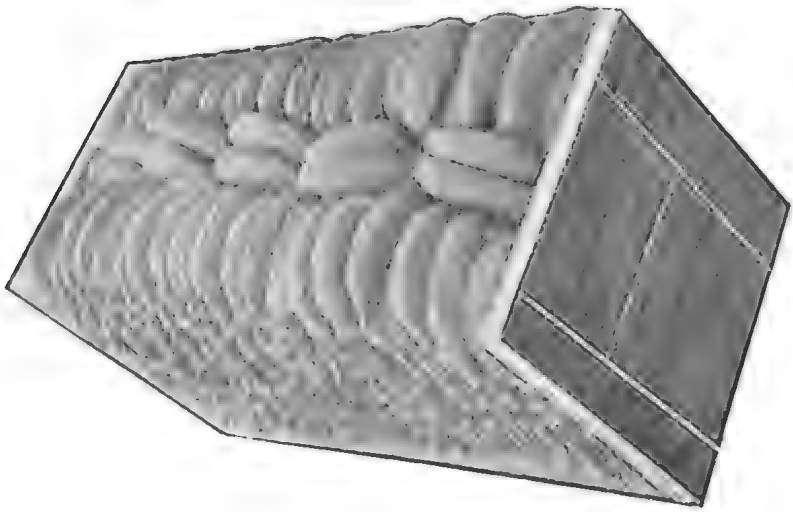


PLATE 265.
"SIXES" SINGLE PACK.

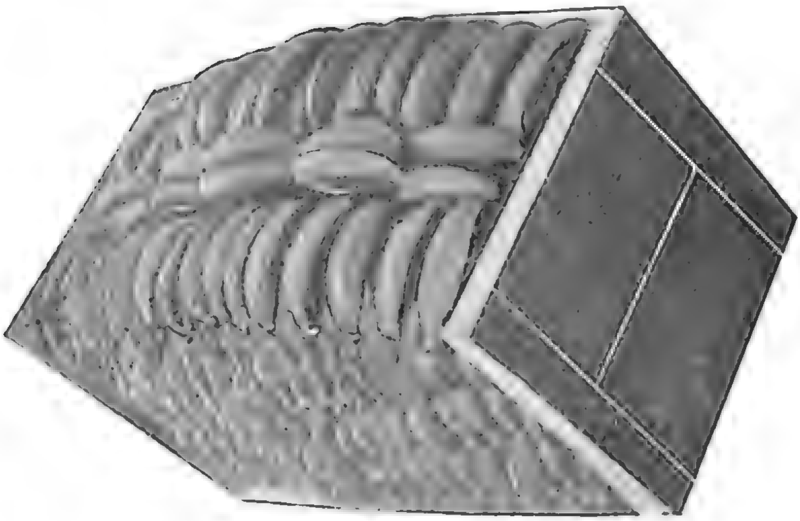


PLATE 266.
"SIXES" VERTICAL TWO PACK.

Cases with lid and side removed.

Finished Cases of Bananas.

"Sevens."

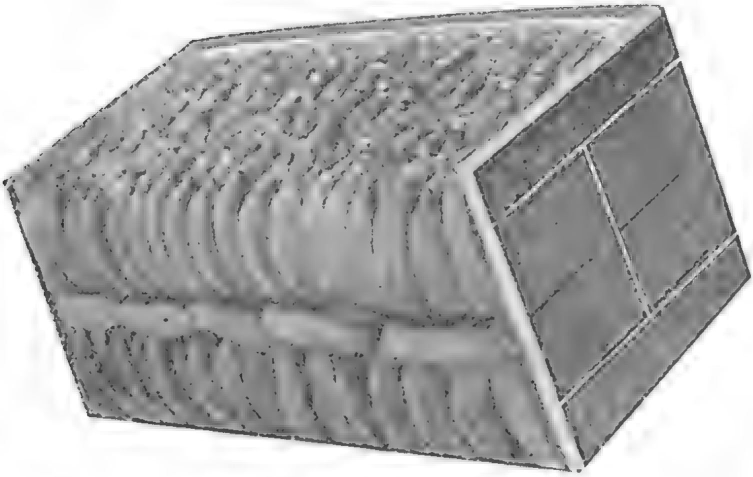


PLATE 267.
"SEVENS" SINGLE PACK.

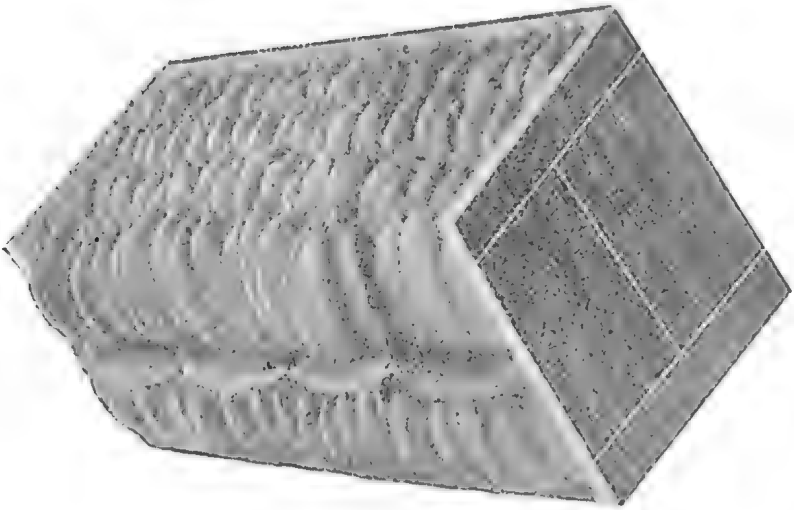


PLATE 268.
"SEVENS" VERTICAL TWO PACK.

Cases with lid and side removed.

Finished Cases of Bananas.

"Eights."

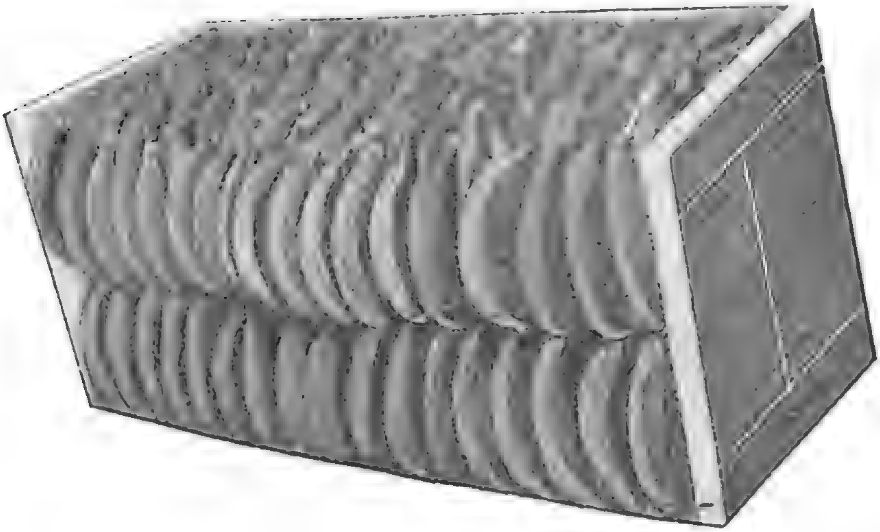


Plate 269.

"EIGHTS" SINGLE PACK.

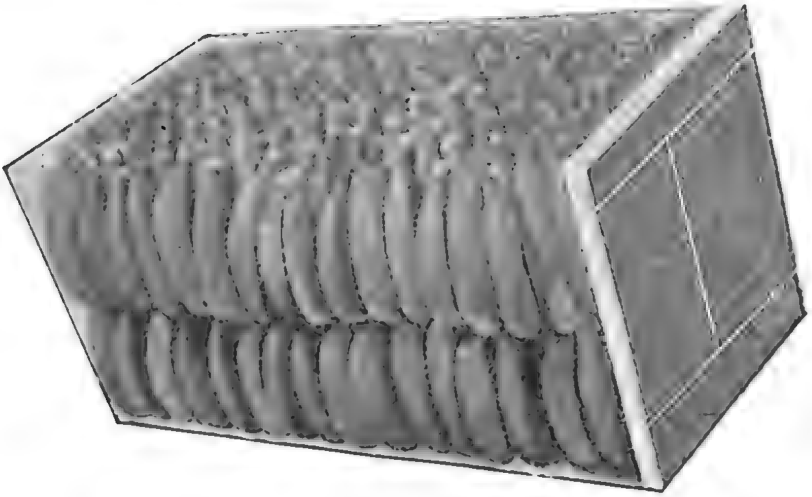


Plate 270.

"EIGHTS" VERTICAL TWO PACK.

Cases with lid and side removed.

Finished Cases of Bananas.

"Nines."

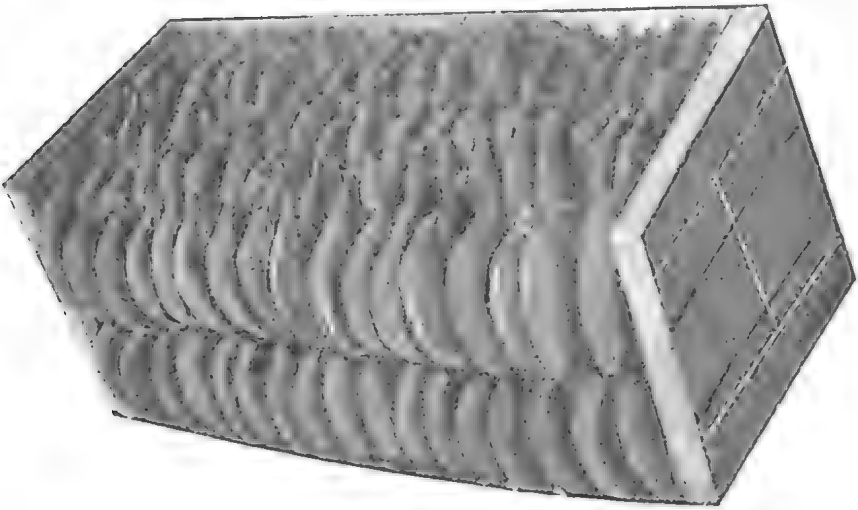


Plate 271.
"NINES" SINGLE PACK.

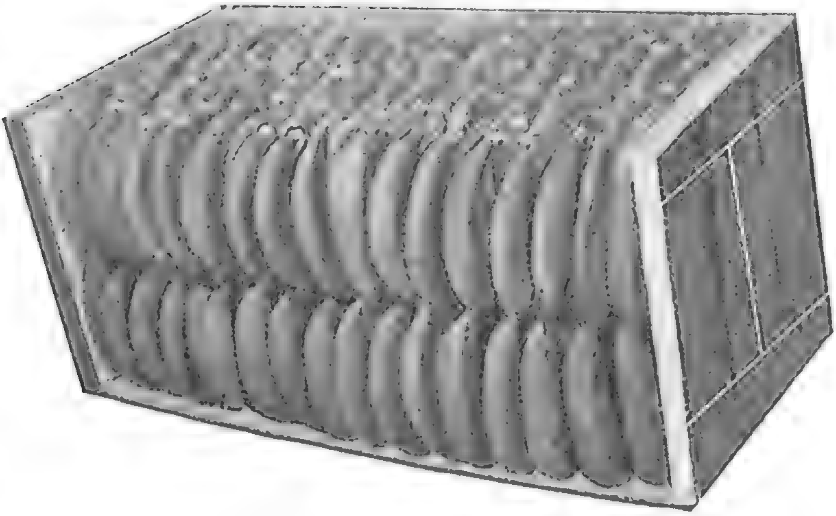


Plate 272.
"NINES" VERTICAL TWO PACK.

Cases with lid and side removed.

good fruit is greatly increased. The difficulty lies in the fact that infection is not noticed at the time of packing, but the development takes place during transit and ripening, to the detriment of satisfactory prices. All packing sheds should be thoroughly cleaned up after using and occasionally sprayed out with a solution of formalin and water—one part formalin to twenty parts of water. All implements should be carefully cleaned and put away until again needed.

NAILING DOWN.

After packing, care should be exercised when nailing down. A good lidding press is a useful part of the packing-house equipment. A careful selection of timber for the lids—first-class boards free from knots—will be found to assist in saving time in nailing down. Boards which split and break during nailing down, particularly if the railing time is near, cause great inconvenience. If a press is not part of the shed equipment, a piece of 3 x 2 should be placed under the end of the box whilst nailing. The lids should be nailed in position by driving the nails in on the angle.

BRANDING.

A little care in this operation can save much future handling. Cases should be branded so that as little confusion as possible is caused to loaders and checkers during transit. It is necessary under the marketing Acts of the various States to place certain particulars on the ends of the cases. The grower's full name and address, the name and the grade of the fruit, must be branded on the case. In addition, the agent's stensil is also placed on one end. An example of good branding would be:—

One End—Shipping and Agent's Number.	Other End—Grower's name and address, name and grade of fruit.
C O D 99 M E L B	J. Jones, Palmwoods, Queensland. Cavendish Bananas, Sixes.

The branding should be neat and not show stencil ink smudges from running the brush over the edges of the stencil plate. Stencils should be made with a good margin around the lettering. Fancy labels would be an advantage with good fruit, but are not generally used in the banana industry as with other fruits.

WIRING.

Wiring cases is an insurance against ullage and bad handling. Two wires are recommended for use. One is placed around each end of the case, running parallel with the edge of the end of the case. The wire should be placed around the box just off the inside edge of the end

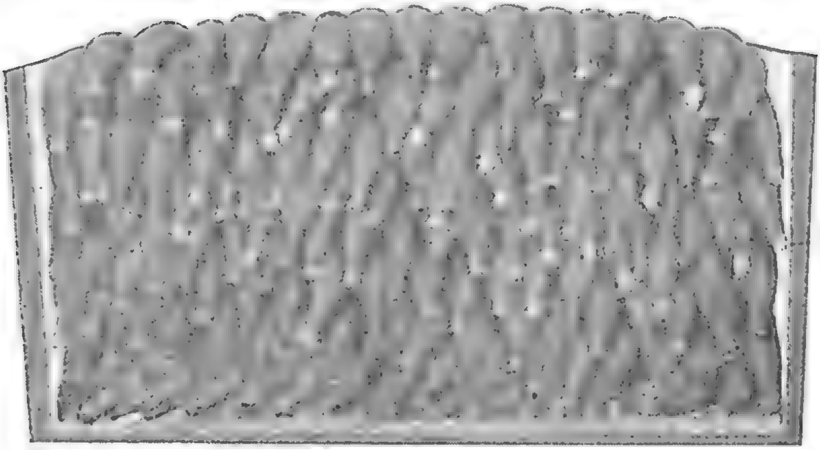


Plate 273.

CASE OF SINGLES WITH SIDE REMOVED.—Note the placing of the fruit in the spaces of the layer beneath.

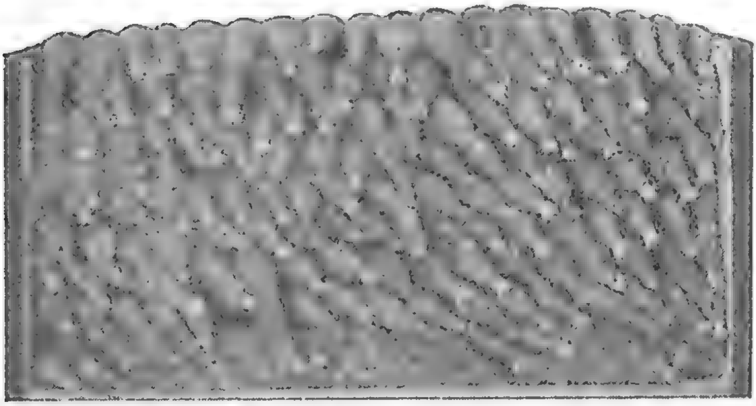


Plate 274.

CASE OF SINGLES WITH SIDE REMOVED.—Compare with Plate 273. In this pack the packer did not take sufficient care in placing the shanks of the fruit well down the side of the box. This to some extent spoils the look and firmness of the finished pack.

Finished Cases, Alternate Layer Pack.

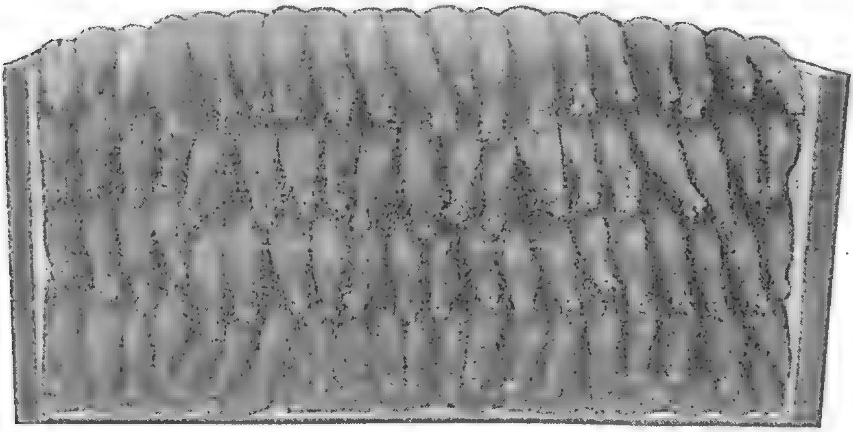


PLATE 275.

CASE OF VERTICAL PACK WITH SIDE REMOVED.—Compare the appearance of the layers in this pack with those of the single pack illustrated in Plate 273.

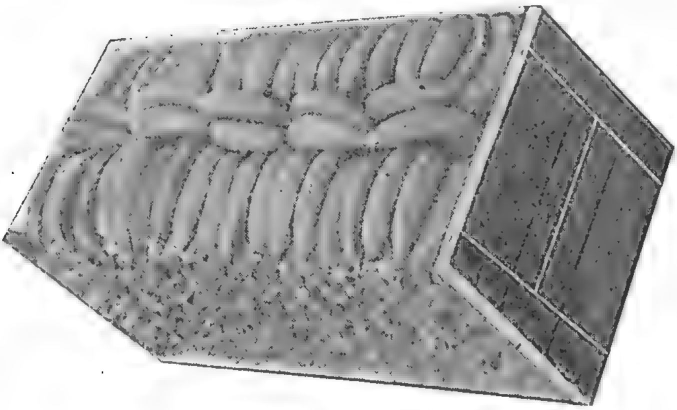


PLATE 276.

CASE WITH LID AND SIDE REMOVED.—Note the placing of the top layer.

Finished Cases, Alternate Layer Pack.

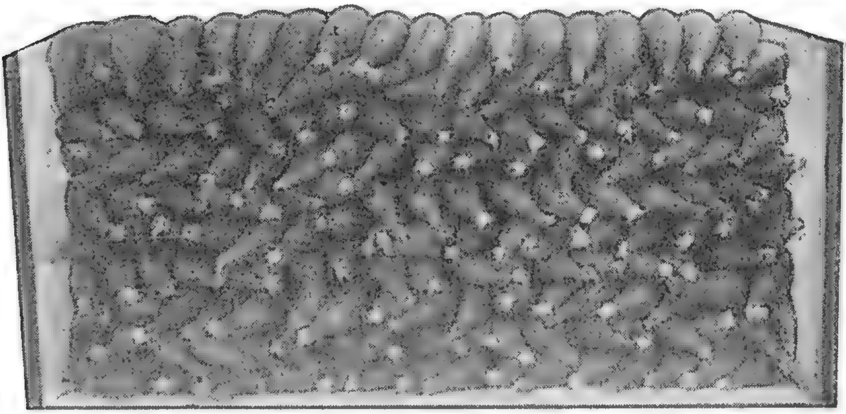
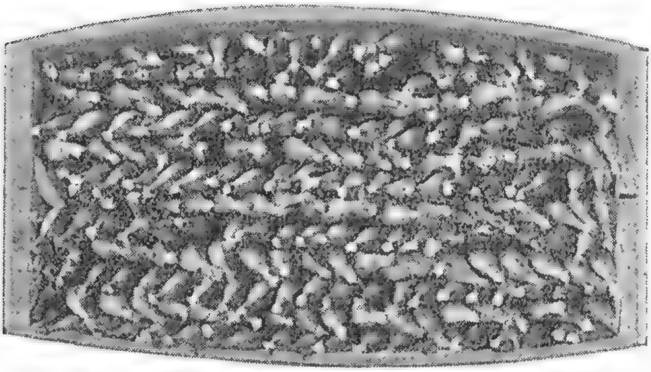


PLATE 277.

CASE WITH SIDE REMOVED.—Note the placing of the top layer, which is placed with the concave side down as in finishing the ordinary single pack.

TOP.



BOTTOM.

PLATE 278.

PACKED CASE NAILED DOWN WITH SIDE REMOVED TO SHOW THE BULGE ON THE TOP AND BOTTOM BOARDS.—This illustrates the necessity of having the bottom boards raised off the floor when nailing the case down.

of the case. When wiring, the machine should never be placed on the lid or bottom, but on the side as illustrated.

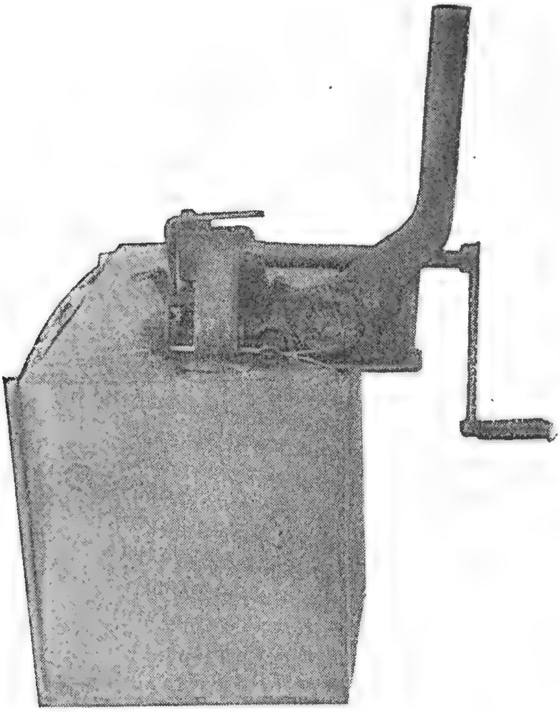


Plate 279.

Showing the position of the wiring machine when applying the wire strapping.

As the whole basis of successful marketing is care, growers should follow this principle right to the finish of their share of handling. Remember, good packing, fancy labels, stencilling, or wiring will not continue to sell bad fruit! It is only by careful attention to detail in handling at all stages that one is able to place on the market bananas that will meet competition and bring to growers a return that will compensate for all the hard work put in on the plantation. It must be remembered that the customer is always right, and it is up to us all to see that satisfaction is obtained by all consumers of Queensland bananas.

ACKNOWLEDGMENTS.

Thanks are due to Mr. R. Rathbone, of Upper Mudgeeraba, for providing the fruit used in the packing illustrated, and Mr. J. McGregor Wills, agent, Banana Industry Protection Board, for assisting to obtain the photographs.

PRUNING OF CITRUS TREES IN QUEENSLAND.

By R. L. PREST, Instructor in Fruit Culture.

IN Queensland there is a wide divergence of opinion on the subject of citrus pruning, which is probably due to the influence of individual pruners who have developed certain systems which they believed suited their trees.

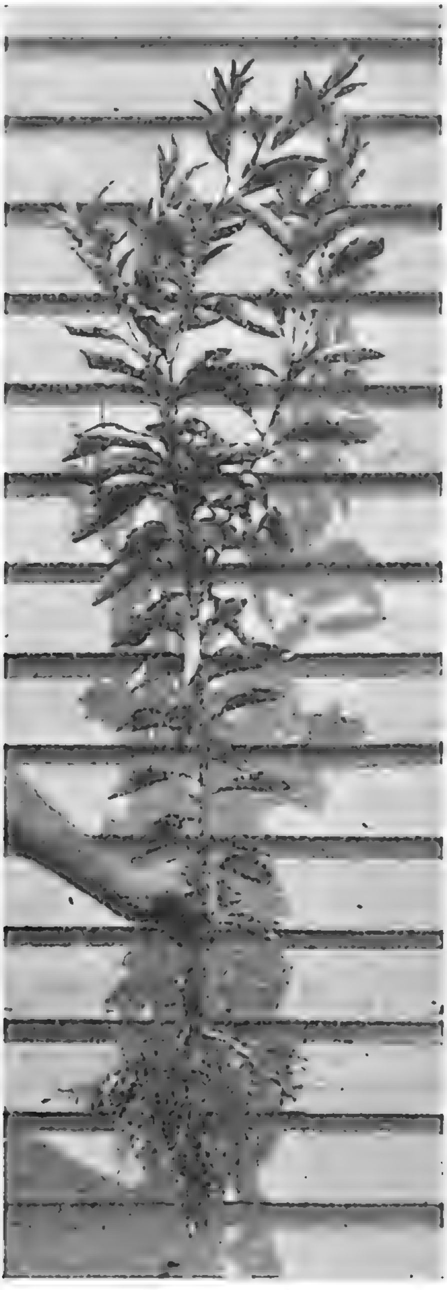


PLATE 280.
A desirable type of nursery tree.

Pruning has, as a consequence, generally developed into a mechanical procedure rather than one based on an understanding of principles involved.

In general terms the method of pruning depends on—

(*a*) The age of the tree.

(*b*) The variety of the tree.

(*c*) The type of tree (whether vegetative or fruiting).

(*d*) Soil and cultural conditions.

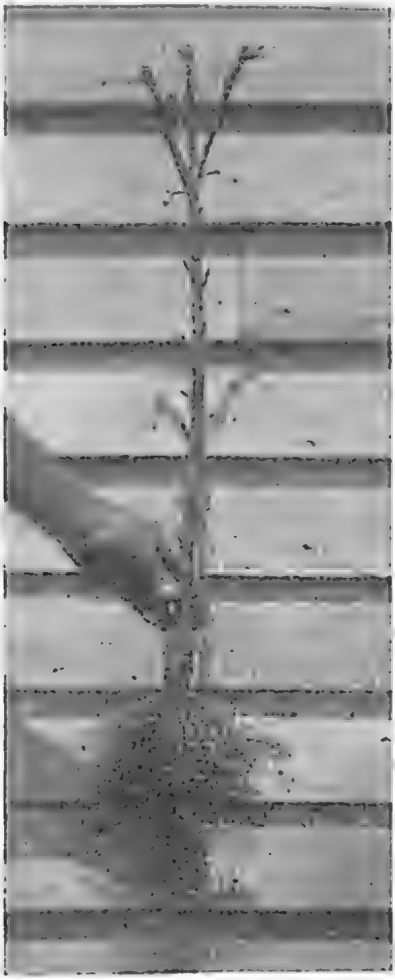


PLATE 281.

The nursery tree shown in Plate 280 prepared for planting.

The main objects in pruning may be classified as follows:—The training of young trees; the removal of undesirable limbs; the modification of form to meet economical and cultural requirements and to counteract unfavourable climatic conditions; the removal of injured and worn out parts; the renewal of old and decadent trees.

Preparation of Nursery Trees for Planting.

The present day tendency of nurserymen is towards the practice of sending out trees carrying large heads, and in some instances shaping them prior to despatch. The former method is best, as the planter is better able to shape the trees as he desires them. The latter is of little benefit owing to damage which may be sustained to some of the branches during transit.

The rooting system should be well washed prior to planting in order to remove any of the mud puddle which may be adhering thereto. Bruised and broken roots require to be shortened, and the head of the tree should be shortened and shaped to develop evenly.

PLATE 282.

A newly-planted tree. Note that the union of the stock and scion is well above ground level.

Training Young Trees.

The pruning of young trees in the orchard should be confined to the removal of adventitious shoots from the stem, and the checking of excessively vigorous growths from the main arms.

It will be noted from Plates 281 and 282 that three main arms have been left on which to build the future tree. Two secondary arms only should be permitted to grow from the ends of each of these main arms in order to develop a strong and well-shaped top. Other secondary arms will grow but should be removed. Undesirable shoots which grow all along the main arms, and which obviously are out of place, would by their continued growth weaken the framework of the tree and should be cut away. In instances where awkwardly-shaped trees are received from the nursery it is often possible to train a shoot which ordinarily

would be out of place to develop and fill up a gap. Such training involves shortening back the required shoot at some dormant period of growth to a bud pointing in the direction it is desired the shoot should grow. Remember that a shoot can be trained in any direction by cutting back to a bud pointing in that direction. Long weak limbs that do not show a tendency to branch should be headed back generally to the limit of the other growths, so that the tree will grow strong, compact, and symmetrical. The top should not be allowed to become too dense; on the other hand it should not be kept so open as to permit the sun scalding the main limbs and branches.

PLATE 283.

Four-year-old Valencia Late.

It is worthy of note that where special bud-selected trees have been planted, they have consistently grown into shapely desirable trees and require very little attention from the pruner.

Plate 283 illustrates a young Valencia Late tree showing growth typical of this variety. This tree requires little pruning beyond the removal of any misplaced or excessively vigorous limbs such as those

at the top marked A and B, which can be cut right back to their source. Any dead twigs and crowded foliage would naturally require to be removed.

Plate 285 illustrates a four-year-old Washington Navel and shows typical sucker growths, the treatment of which is sometimes apt to puzzle the pruner.

PLATE 284.

The tree in Plate 4 after pruning. Note that the excessively vigorous limbs marked "A" and "B" in Plate 283 have been removed.

As a rule such sucker growths may be considered parasitic, but they do not necessarily remain so, for in many instances they later produce bloom and fruit of normal fulness. Generally in practice it is a good plan to remove such growths, remembering that the fact that they can be curbed and induced to fruit makes it possible at times to utilise them for replacing broken and damaged limbs.

Provided that a well-developed framework has been maintained, young well-grown citrus trees should come into profitable bearing at an age of between four and six years. During the first years of bearing pruning should be directed towards the removal of suckers and decadent first-fruiting shoots. Where pruning operations have been diligently carried out on young trees, they require very little pruning during several following years, though they should be gone through annually and suckers and dead wood removed.

There is no doubt that the low production in the case of many old but well cared for orchards is due to the lack of vigorous healthy fruiting wood. This condition points to the necessity for a periodical renewal of fruiting wood, which can be best accomplished by thinning out and at the same time shortening back terminal growths and twigs. The cuts should be made right back to strong new growths, removing weak shoots and those that have borne fruits. The thinning leaves space for the necessary subdivision, whilst the shortening back tends to force into growth dormant buds from behind, stops the excessive growth of any branches, and at the same time renews supplies of

PLATE 285.

Four-year-old Washington Navel, showing typical sucker growths.

fruiting wood. Where crowding is evident, the removal of entire branches is at times desirable. The entry of plenty of light and air assists the growth of healthy and vigorous shoots from behind the outside ring of foliage. These shoots make new fruiting wood. Any excessive growth of suckers or water sprouts arising from well inside the tree following heavy pruning require to be cut away or they will absorb a lot of the vigour of the tree and crowd the centre.

In older trees where vitality has been impaired, provision will require to be made for the removal of old crowded and decadent limbs. In such instances pruning is of a much heavier nature, requiring the removal of entire branches. Such branches should be cut right back to

their source of origin, so that the sap is readily diverted to the remaining limbs, encouraging new fruiting wood. Under no circumstances whatsoever should stubbing be resorted to. In instances where it is necessary to replace the larger limbs the work requires to be done gradually over two or more years to avoid excessive suckering.

PLATE 286.
Sucker, marked A at the top of tree shown in Plate 285, after removal.

Lower branches of the trees should not be allowed to touch the ground, as fruit borne on such branches is generally blemished and of poor quality. On the other hand trees should not be pruned too high from the ground. The height to which they should be lifted varies according to circumstances; in most instances knee-high will prove to be satisfactory.

In Queensland the regular thinning and pruning of bearing trees is definitely necessary. Frequent and regular treatment tends to preserve as nearly as possible the balance between the root system and aerial portions of the tree, assists in the control of economical and cultural requirements and counteracting unfavourable climatic conditions.

Mandarins.

The majority of mandarins when not systematically trained and pruned are often merely shrubs, not trees. They naturally grow very densely, and unless regularly thinned out and shortened back after the fruit has been harvested the massed twigs become so dense that many perish and the remainder are so weakened that only small inferior fruits are produced.

PLATE 287.
The tree in Plate 285 after pruning.

The treatment at planting is identical with that of the orange. After the first season from planting numerous vigorous upright shoots arise from the head of the tree. While small these should be thinned, leaving only those which will assist in building a desirable framework. These should be carefully watched, and where the growth becomes too lengthy, shortened in to a lateral growth, and where laterals are not present headed back to the limits of the other growths. Heading back and thinning may be done when the growths have hardened, not when they are soft and growing rapidly. It is possible to check excessive growths by pinching out an inch or so of the tips.

The densely-growing habit of the mandarin, leading to a profusion of weak shoots, is responsible for overbearing and resultant small and inferior fruits at an early age. Providing that a well-developed framework has been maintained, young well-grown mandarin trees may be permitted to bear at four years of age. The annual pruning of bearing

mandarin trees requires the same regular and close attention as in training and forming young trees. The dense growths and crowded branches require to be well thinned out and shortened back to vigorous laterals of current season growth, removing weak twigs and where

PLATE 288.
Four-year-old Glen Retreat Mandarin.

possible shoots that have borne fruits. Such annual treatment permitting ample light and the ready circulation of air throughout—(1) greatly increases the vigour of the tree; (2) suppresses surplus growths and twigs; (3) improves the size and quality of the fruit, and (4) provides for the renewal of ample young and vigorous fruiting wood.

Lemons.

With lemons the general practice with growers has been to prune severely while the trees are young in an effort to control the growth and so produce a strong framework. In some instances such treatment has retarded growth, and certainly it has retarded the early fruiting of the

PLATE 289.

Tree in Plate 288 after pruning.

trees. Apart from the necessary trimming at planting, which, similarly to oranges, consists of shortening back and removing broken and bruised roots, and a corresponding shortening back of the head of the tree in such a manner as to produce a strong straight stem with three or four

well-placed arms radiating therefrom, little pruning should be done during the first two or three years. All that is necessary is a light thinning to remove any undesirable shoots that are out of place and would later upset the balance of the tree, and perhaps a shortening of

PLATE 290.

Twelve-year-old Glen Retreat Mandarin before pruning.

excessively vigorous shoots. Main upright-growing limbs, evenly spaced, should be selected as main leaders. As the trees get older these become weighted down at the ends by subdivision and the weight of fruit and strong side shoots will arise from them. These side shoots should be

thinned out, but not all removed. Those left should be shortened back to form spurs which will produce the best fruit. Suitable growths close to the centre of the tree may be left to grow upright and take the place of the first leaders which have been weighed down.

Plate 291.
Twelve-year-old Glen Retreat after pruning.

In time it will be found the tree is built up of series of tiered branches radiating from the main framework. The object of building up the tree in this manner and spurring it is to encourage a fruit-bearing habit. This is explained as follows:—As the fruit weighs the

vertical branches down to a more horizontal position, the vigour of the branches is reduced, and side shoots arising from such branches are, when spurred as outlined above, conducive to fruit production.

When shortening side shoots, the cuts should be made well back into ripe wood, thus throwing the sap into dormant buds. Light wood

PLATE 292.
Typical young lemon tree.

issuing from inside the more erect permanent arms may be retained, shortening for spurring, and from time to time renewed. No rank growth should be tolerated unless it is required to continue the work of

Plate 293.
Lemon leader weighted down. Note strong side shoots.

Plate 294.
The fallen leader shown in Plate 293 after thinning and shortening back the side shoots.

some displaced leader. As the limbs drag down it will be necessary from time to time to lift the tree by removing some of the lower limbs.

PLATE 295.
Badly framed young lemon.

Renovating Decadent Trees.

The renovating of many of our old citrus orchards which are rapidly failing in productivity and health constitutes a serious problem. The cause of the decline of citrus trees in Queensland is chiefly due to

starvation together with a combination of climatic and soil conditions. The characteristics of decadent trees may be enumerated as follows:—

(1). Increased percentage of small-sized fruits.

(2) Decreased yield.

(3) Dwarfed foliage in the tree tops.

(4) Weak leafless fruiting wood.

(5) Heavy production of weak blossom.

PLATE 296.

The same Tree illustrated (Plate 295) after pruning.

There are numerous instances where many of our old and decadent trees may be profitably renovated. Several methods have been used in rejuvenating citrus trees—deheading (by which is meant the cutting back of the tree to three or four main arms to within 18 inches to 2 feet of the main stem); a modification of this in which the secondary

PLATE 297.

A Decadent Lemon Tree.

branches are stubbed back to a foot or so in length. Both these methods are somewhat severe, as in removing the entire top of the tree, the balance is upset and the rooting system weakened. Skeletonising—a much less severe method—has now found favour and is giving satisfactory results.

The entire framework of the tree is generally left, except where crowded and diseased limbs require to be removed. Cross limbs and unnecessary leaders are cut out or shortened back. An entirely new fruiting system is built up from the remaining skeleton. The degree of severity of cutting back depends upon the condition of the tree. When declining trees are cut back in this manner, it should be remembered

PLATE 298.
The same Tree shown (Plate 297) after pruning.

that the bark is very susceptible to sun scald and all the exposed limbs must be thickly coated with a suitable whitewash for protection. A simple whitewash formula can be made as follows:—

Quick Lime	7 lb.
Sulphur (powdered)	2 lb.
Salt, flour, or size	1 lb.

As the lime is slacked down, the sulphur and salt should be well stirred in, and sufficient water should be added to bring the mixture to the consistency of a good paint.

SOME TROPICAL FRUITS.

4. THE BREAD FRUIT.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE Bread fruit is a tropical member of the order Urticaceæ, a family which also includes fruit so widely differing as the mulberry, the fig, and the jack-fruit.

The native habitat is generally regarded to be the Malayan archipelago, where it has also been cultivated since very remote times. From there it spread many centuries ago throughout the tropical Pacific Islands. In Polynesia it has been a staple article of diet amongst the natives for many hundreds of years. About 150 years ago the fruit was considered of such value that the British Government sent out a special expedition to introduce it into the West Indies. The expedition proved abortive on account of the mutiny of the crew, their seizure of the ship, the "Bounty," and their subsequent establishment of a colony on Pitcairn Island. A later expedition successfully transported a large number of plants to the West Indies. They did not prove so popular an article of diet with the negroes, however, as they were with the Polynesians.

Introduction into Queensland was effected some thirty to forty years ago. The fruit did not become a popular one here, however, and the occurrence of trees is now very restricted. In fact it is doubtful whether more than a dozen trees could now be found in Queensland. This is indeed to be regretted, as, apart from the value of the fruit, the Bread fruit tree is a very ornamental shade tree and would be a distinct acquisition to tropical parks and gardens.

When grown under favourable conditions the tree will reach a height of 40 to 60 feet. The leaves are large—up to 2 feet long—ovate and leathery, entire at the base and three to nine lobed at the upper end. They are light-green in colour and are clustered towards the ends of the branchlets. The small branches grow at a thickness of nearly an inch in diameter and are very pliable. The fruit is carried on short thick stalks on the ends of the branches and grows to a size varying from 4 to 8 inches in diameter. The skin has a rough surface, is green when young and changes to greenish yellow when ripe. The flesh is mealy and white in young fruit and assumes a yellow tint as it ripens. In the Cairns district the tree blooms during November and ripens its fruit during April and May. In other parts of the North, however, it is reported to have a much more extended season.

The fruit is used as a vegetable and for this purpose is picked before ripening, whilst the flesh is still white and mealy. Boiling or baking is the common mode of preparation amongst the islanders, but most Europeans regard slicing and frying like potato chips as the most palatable method of preparation.

There are two distinct varieties of this tree, the one seedless and the other seeded. The fruit of the seeded one is regarded as very poor and the flesh is seldom eaten. However, it contains a large number of seeds which, when roasted, form a palatable nut said to resemble a chestnut in flavour. This variety is frequently referred to as the Bread nut to avoid confusion with the seedless, or edible fruited variety. The seedless variety is generally regarded as being a horticultural one originally propagated

from the seeded variety, but both have been known since very early times so the origin is somewhat obscure. Both varieties bear the botanical name of *Artocarpus communis*, Fost. or *Artocarpus incisa*, L.

The Bread fruit is a distinctly tropical tree and will not withstand cold. A number of attempts have been made to grow it in the United States of America; but W. Popenoe reports that no trees have been known to survive to fruiting age, even in Southern Florida. Even in its native regions it will not thrive in the cooler altitudes about 2,000 feet. It appears to be purely a fruit of the tropical low land country.

To obtain the most favourable results the trees should be given ample room in an open situation, on good rich, deep, and well-drained soil, with ample soil moisture. Lack of any of these essentials will result in an unthrifty tree which most probably will not fruit.

Plate 299.

Bread Fruit Grove.

Note the manner in which the tree spreads by means of root suckers.

Under suitable conditions the natural habit of root growth is shallow and widely spreading. A regular network of roots is formed just beneath the surface of the soil, and frequently short sections protrude. Wherever this occurs and the root bark becomes scarred a sucker arises. The sucker soon develops an independent root system and forms another tree. In this manner one tree will soon develop into a grove if the suckers are not kept down. This habit of suckering is made use of in the propagation of new trees of the seedless variety. When a sucker arises a section of root carrying the young shoot is carefully severed from the parent tree and transplanted. When it is desired to raise a number of young plants a tree is frequently induced to sucker by cutting a number of the smaller roots and raising the cut end above the soil. By maintaining plentiful soil moisture the severed root is forced into aerial growth and is then transplanted.

In the Philippines a method of propagation has been evolved which is less wasteful of root than this. Roots of $\frac{1}{2}$ inch up to 2 inches in thickness are dug up and cut into sections of about 10 to 12 inches in length. These are then planted in coarse sand or sandy loam in a slanting position with about 2 inches of the thick end above the soil, and treated as hardwood cuttings. Care is necessary in the preparation of the roots that they are not allowed to dry or to become damaged. The propagation should be carried out during the wet season.

CITRUS NOTES.

By R. L. PREST, Instructor in Fruit Culture.

DURING the months of September and October, citrus centres along the North Coast, South Coast, and Gayndah district have received good falls of rain.

The favourable conditions experienced are now reflected in the greatly improved appearance of the trees in those orchards receiving good cultural attention. The blossoming has been very satisfactory.

Mr. H. Collard, Assistant Instructor in Fruit Culture, reports that the budwood plot is looking well. Lemons (which appeared to have been slightly affected by cold during the winter) have now assumed a good leaf growth of normal colour. The W. Siletta, Joppa, and Marsh Seedless trees planted in September are making satisfactory headway.

In the Torbanlea-Burrum district brown spot of the mandarin is again noticeable. The disease is observed to a greater or lesser extent in the majority of orchards, but appears, however, to be more pronounced where spraying has been neglected or has been delayed until the disease has become manifest, in which cases the fruit in addition to the foliage is affected, causing a fairly heavy shedding.

It also appears that trees which were sprayed before the disease definitely became noticeable prior to recent rains, although not entirely free from spot, have suffered least from the disease. Spraying (chiefly with Burgundy) has afforded an appreciable measure of control up to the present date.

In all centres, departmental field officers have been busily engaged in carrying out instructional duties in general cultural problems, pruning demonstrations, and field days, particularly with regard to tree renovation.

MARKETING NOTES.

By JAS H. GREGORY, Instructor in Fruit Packing.

NOVEMBER has gone, and if the hot weather experienced during the month is an indication of the coming summer weather, we may expect a warm time. Warm weather conditions stimulate the sale of fruit; so growers can go philosophically to work during the hot spells. At the same time we read of record low temperatures for the month at Stanthorpe. This again should assist the fruit industry, the cold snaps, as a rule, assisting greatly to control many of our entomological troubles. At the present time shops are displaying their greatest variety of fruits for the year. New season's cherries, mangoes, plums,

and peaches are displayed alongside the old season's oranges, grape fruit, apples, and pears, and the ever-present pineapples, papaws, bananas, lemons, and passion fruit.

Apples.

The advice given in our last issue still holds good. Apples in cold storage should now be placed on the market. Yates and small-sized Democrats are holding the best. Some lines of Sturmers and Granny Smiths are giving trouble with " sleepiness " and rots. Prices are the highest for many seasons. Firm lines are selling in Brisbane up to 16s., whilst good lines of Granny Smiths are realising up to 18s. New season's apples will shortly be on the market. Growers will be well advised to keep small green apples off the market. Where green fruit is marketed as cookers, it should be at least 2½ inches in diameter. Fruit under this size is not popular as a cooker, and, not being fit for anything else, will soon help in creating a glut.

Cherries.

Early cherries have arrived in excellent condition this season, 4s. to 9s. per tray being the price received. The packing has been excellent. Some lines of Stanthorpe realised 12s.

Plums.

The first consignment of plums sold at 8s. to 9s. per case. The quality generally was only of a fair standard, which should improve as the season advances.

Peaches.

" China Flats " have been in good supply and of mixed quality, 1s. to 3s. per tray being realised. Early Stanthorpe have been in good demand. Small sizes are unpopular.

Apricots.

At 8s. to 13s. per case, early consignments have sold well. Small sizes are in poor demand.

Citrus.

Good oranges have sold up to 10s., the market being firm. A few poorly coloured fruit from the second crop have been hard to move. Growers would do better to remove this fruit from the trees before it has time to grow, as the price usually obtained does not warrant the strength taken from the tree. Prices up to 13s. have been obtained for first-class cured lines of lemons. The extra trouble employed in curing, as a rule, is amply repaid by better keeping quality and prices.

Mandarins are now getting scarce, the quality being poor.

Passion Fruit.

Passions are selling well up to 17s. per case. Keep the smooth-skinned fruit apart from that with wrinkled skins. Crinkled fruit should be marketed in separate cases. Up to 40s. per case has been realised in Melbourne and Sydney; half-bushels to 20s.

Papaws.

Southern consignments which show less colour than those despatched during the last few months can now be packed. The writer of these notes has just returned from visiting northern districts. The excessive use of padding materials has been the cause of reduced prices on northern markets. This and the harvesting of too green fruit are important problems. The dry weather has had an adverse effect on the quality of the fruit. Brisbane prices are firm for good fruit, up to 9s. per 1½ bushel case being obtained. Prices as low as 2s. per case have been taken for poor lines. Careful marketing by all growers would not allow of this great difference in prices. The southern markets still remain firm for good well-coloured lines—Sydney, 8s. to 12s.; Melbourne, 7s. to 10s. per 1½ bushel case.

Mangoes.

Melbourne and Sydney consignments should consist only of the high-class fibreless fruit. The common method of harvesting by knocking the fruit to the ground should be abolished. Many consignments arriving in Brisbane show signs of bad handlng. Common varieties at present on the market in Brisbane have been greatly handicapped by the large percentage of green, immature fruit packed. Consignments from the Townsville district have had this fault to a marked degree. Prices from 5s. to 8s. have prevailed. The use of half-bushel cases is recommended. Consignments for the South should be wrapped and layered in woodwool for the best results.

Bananas.

Carelessness in packing is still manifest in some consignments. More care should be taken whilst breaking up the hands into singles. We apparently are content to suffer the single pack, with its greater risk of black end, &c. The best bananas on display at present are full and part hands. One wonders why the vertical two pack is not used more by "finger" packers. Greater care must be taken in selecting fruit for the South. Fruit should also be thoroughly cooled before packing. Cases have realised up to 10s. in Brisbane; Melbourne, eights and nines 11s. to 12s., sevens 9s. to 10s., sixes 7s. to 8s.; Sydney, nines 14s. to 15s., eights 11s. to 13s., sevens 9s. to 11s., sixes 6s. to 9s.

Pineapples.

Brisbane prices show an excellent return—up to 10s. a dozen. A few sales over 11s. per case for good lines were reported. Northern growers sending in cases should not omit packing material; woodwool is advised for preference. If this not available, grass should be used. It is necessary that the grass be thoroughly dry. Cool the fruit before packing, and keep it cool after the cases are lidded. Every care must be taken in handling pines. Remember that smooths are the popular fruit in the southern capitals. Melbourne and Sydney prices were 10s. to 14s. per case.

Tomatoes.

The season, owing to the hail in the Redlands district, has been one of mixed qualities. Prices have maintained themselves well for good lines in Brisbane and Sydney, although Melbourne market collapsed early in the month under the influx of tomatoes from all States. Prices in

Brisbane were: Green 3s. to 4s., ripe 3s. 6d. to 5s. 6d.; in Sydney, 3s. to 6s., a few Coff's Harbour to 10s. Late in the month Brisbane prices climbed to 8s. for good fruit.

General.

A survey of marketing operations shows more than ever that regular consignments to the market pay the best. Trying to beat the market with small and large consignments sent at irregular intervals does not pay, and has an upsetting effect on the market. Regular consignments give the agent a chance to establish and maintain a connection.

Publications.

It is expected that booklets on marketing bananas and apples, with a packing chart for lemons, will be available in the next few weeks. Copies may be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

HOLDING A HORSE—A POINT FOR THE YOUNG STOCKMAN.

People working among stock frequently have to walk long distances to catch their mounts after having done the job on hand. The illustration shows an effective way of stopping this little gallop, and still allowing the horse to feed. The reins

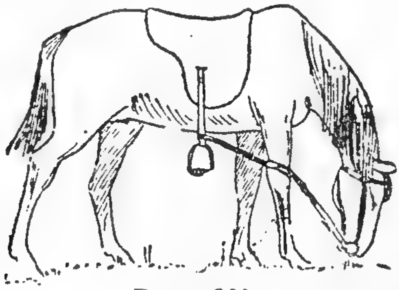


Plate 300.

are taken round the inside of the leg above the knee, brought back underneath themselves and fastened to the stirrup-iron in the ordinary way. This prevents the horse from lifting its head, and will be found most satisfactory in practice.

CONTRIVANCE FOR HARROWING.

Here is a simple contrivance which will do away with all the walking when harrowing. Get two small wheels and an axle, the old front carriage off a set of discs is excellent, as the axle is short, and the wheels of a handy size. Take a six foot length of 6 x 2, and bolt one end on to the axle, and nail on a small skid at the other end. Then fix a box for a seat on to the 6 x 2 above the axle and a piece of wood across the 6 x 2 at a convenient distance for a foot-rest. Fix a chain from the skid to the drawbar of the harrows, and you can harrow at ease with practically no extra draught on the horses.—"The Canegrowers' Weekly" (Mackay).

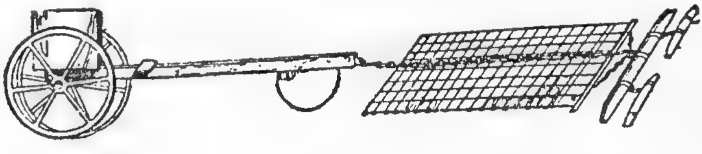


Plate 301.

"Cotton King" Attachment.

Canegrowers are generally agreed that the "Cotton King" disc cultivator is very severe on the horses employed to operate it; and those farmers who study the comfort of their animals will be interested in the accompanying photographs of a device which is employed in the Cairns district.

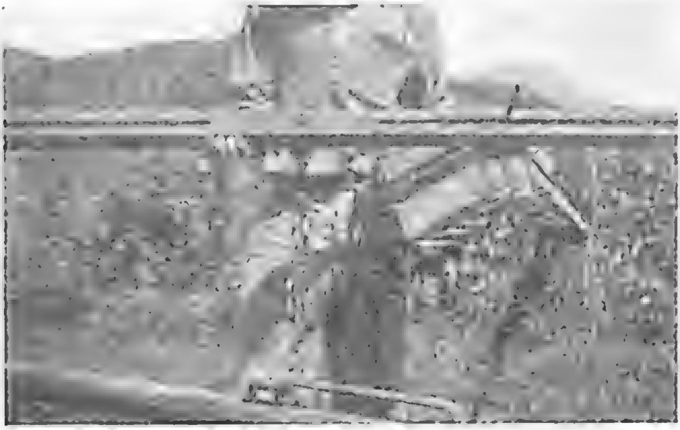


PLATE 302.
Showing the Construction of the Cross-bar.

PLATE 303.
Illustrating the Method of Attachment to the Pole.

The weight of the implement is carried by a 6-feet length of 3 in. x 1½ in. hardwood provided with two slots each 2 ft. 2 in. long and ¾ in. wide. This is fitted to two spikes with which the saddles are provided, and is attached to the pole by means of a length of chain. The arrangement is quite simple and very effective.

—G.B., in the "Cane Growers' Quarterly Bulletin," Bureau of Sugar Experiment Stations.

LIST OF REGISTERED STALLIONS.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under *"The Stallions Registration Acts, 1923 to 1934,"* during the year 1935-36:—

Blood Stallions Certificated for Life During Year 1935-36.

Name.	No.	Age.	Description.	Owner.
Ago-Lily	1130	Aged	Bay	J. V. Coughlan, Willah, *via* Yeulba
Almond	1566	5	Bay	L. Onions, Mondure
Ambermond	1567	5	Bay	C. R. S. Smith, Mount Joseph, Brooweena
Arboreal	1519	5	Bay	M. Ryan, Ascot Chambers, Brisbane
Armlie	1568	6	Bay or brown	R. Bawden, Gillen's Siding
Avonia	1197	Aged	Brown	L. S. Richards, Mount Hillalong, Nebo
Bachelor's Heir	1520	5	Chestnut	K. Brennan, Boonah
Bachelor's Lodge	1131	5	Bay	W. Redman, Braemar
Bilbo	1171	5	Brown	J. B. Shannon, Tooloombah, Rockhampton
Brown Lock	1569	Aged	Bay or brown	J. P. Walsh, Mount Perry
Brown Lock	1564	6	Bay	M. J. Rynne, Maryvale
Burn Lad	1132	5	Chestnut	J. Cantwell, Chinchilla
Byramjee	1521	5	Brown	Mrs. F. Black, care of C. Connell, Manson road, Hendra
Chako	1191	Aged	Black	A. B. Turner, Tiverton, Nebo
Chantena	1570	Aged	Bay	Jones' Bros., Eureka, Eidsvold
Dalmain	1571	5	Bay	A. P. Gibson, Boolboonda
Deltrim	1172	Aged	Bay	J. W. Holland, Bushley
Egera	1192	Aged	Bay or brown	P. Ussher, Lake Elphinstone, Nebo
Fiery Bachelor	1133	5	Bay	D. Reen, Alice street, Toowoomba
Flying Painter	1134	5	Bay	W. Gillies, East Cooyar
Forceona	1522	5	Grey	T. J. Spence, care of W. A. Tucker, Hendra
Fox Earth	1547	6	Brown	J. G. McDougall, Lyndhurst, Warwick
Grand Revel	1572	Aged	Bay	W. E. Sauer, Gayndah
Grenade	1136	5	Grey	O. Ridge, Windsor, New South Wales
Gunborough	1523	5	Black	T. Kidd, Windorah
Guy Fawkes	1573	5	Chestnut	J. P. Walsh, Mount Perry
Happy Returns	1136	5	Bay	E. W. Walker, Oakey
High Exchange	1524	6	Bay	Reynolds and Bell, Winchester street, Hamilton
Jay Orr	1180	Aged	Roan chestnut	A. G. Lawrie, Westwood
Jean Jacques	1525	5	Chestnut	W. Bullock, Booval
Jehad	1574	5	Chestnut	W. G. Hein, James street, Howard
Jemmatic	1575	5	Bay	L. Wedemeyer, Eidsvold
Jigga Jigga	1193	Aged	Bay	A. D. Shannon, Oxford Downs, Nebo
Kenwinning	1137	6	Chestnut	A. G. R. Liddle, Woodlawn, Bell
Kerbonte	1138	5	Brown	F. King, Bell
King Baralong	1526	5	Bay brown	J. Douglas, Sandgate
Kinglock	1179	5	Bay	A. G. Lawrie, Westwood
Lalaguli	1548	Aged	Bay	J. A. Parker, Lalaguli
Leolita	1527	5	Bay	T. Jennings, Greenmount
Lord Lever	1563	5	Bay	H. Brown, Warwick
Love's Gift	1194	Aged	Chestnut	I. A. Perry, Peel street, Mackay
Lucky Boy	1576	Aged	Dark bay	J. G. Gogan, Kilkivan
Marco Day	1139	5	Brown	W. H. Richards, Chinchilla
Matador	1173	Aged	Bay	Joyce and Joyce, Eidsvold
Memorial	1577	5	Bay	Pownall and Pownall, Mount Perry
Merry Malster	1578	5	Bay	Seiler Bros., Durong
Mistletoe	1195	6	Bay	E. Doyle, Marian
Mountain Oak	1174	6	Chestnut	R. W. H. Smith, Princhester
Mulga Willa	1196	5	Brown	E. Gillham, Glendon, Nebo
Night Piper	1528	6	Brown	Mrs. D. Lay, Kent street, Ascot
One Name Pioneer	1579	6	Bay	T. M. Leane, Bancroft, *via* Monto
Pavonian	1198	Aged	Chestnut	A. Williams and Co., Homevale, Nebo
Pially	1199	Aged	Bay	A. J. Carden-Collins, Tondara, Gumlu
Pickle Branch	1140	Aged	Chestnut	J. L. Watts, Tara
Prince Fox	1549	Aged	Bay	W. H. Donovan, Belah, Stanthorpe
Proud General	1200	Aged	Bay	W. H. Gillham, Suttor Creek, Nebo
Ras Kas II.	1175	Aged	Bay	A. and J. Rea, Eden Garry, Kunwarara
Robin	1201	Aged	Bay	G. K. Gordon, Mount Pleasant, Binbee
Rosamber	1529	5	Bay	T. Jennings, Greenmount
Rossini	11550	Aged	Bay	Pearsby Past'l Co., Stanthorpe
Saint Grafton	1530	5	Brown	J. D. Kirwan, Lisson Grove, Wooloowin
Seaforth	1176	Aged	Chestnut	L. A. Mackenzie, Telson, Dingo
Serewick	1580	5	Brown	T. J. Campbell, Kolonga, Gin Gin
Siemon's Fort	1141	Aged	Brown	W. W. J. Lloyd, Harrow
Sir Bluewin	1551	5	Bay	M. Brosnan, Dragon street, Warwick
Soft Step	1531	5	Brown	W. J. Tucker, Hendra
Southern Don	1581	5	Chestnut	D. A. Proctor, Kalliwa, Mount Perry
Stanfred	1581	5	Dark chestnut	F. S. Lord, Brooklands, Nanango
Syce Lad II.	1583	6	Bay	H. E. Stewart, Paloma, Comingla
The Irishman	1532	5	Bay	Mrs. M. Kelly, Gympie road, Kedron
The Orphan	1202	Aged	Cream	H. Rowe, The Hollows, Mirani
Two Up	1203	5	Bay	Dr. Dalrymple, Mackay
Wallanbah	1204	Aged	Black	A. Williams and Co., Homedale, Nebo
Warwickeye	1533	5	Black	L. Dixon, Hendra
Wittabits	1534	5	Chestnut	C. Bergann, Witta
Wool Top	1178	Aged	Bay	J. McEvoy, Mount Lucas, Boongarry
Young Ayrbridge	1503	5	Brown	J. W. McKenzie, Dayboro

PONY STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1935-36.

Name.	No.	Age.	Description.	Owner.
Aden's Chief ..	1165	5	Grey ..	J. V. Willis, Meringandan
Bonnie Lad.. ..	1516	Aged	Cream ..	J. M. Newman, Caboolture
Carbine	1181	5	Black ..	G. P. Clanfield, River street, Mount Morgan
Ding Dong	1166	6	Bay	J. C. Mann, Yarranlea
Hailstone	1167	5	Grey ..	H. V. Farquharson, Newtown, Toowoomba
Kalbar	1517	5	Brown ..	J. Yarrow, Silverdale, Kalbar
Laddie	1536	5	Dark taffy ..	E. A. Furniss, Eumundi
Larrikin	1205	5	Taffy.. ..	R. Whittington, Oakenden
Little Don ..	1605	5	Bay	H. W. Wieland, Greenview, Wondai
Little Mischief ..	1606	5	Chestnut ..	R. Humphreys, Boompa
Little Prince ..	1607	Aged	Taffy.. ..	H. Richards, P 146, Bailey, *via* Monto
Mog Wamp ..	1608	Aged	Roan.. ..	T. E. B. Dingle, Mount Perry
Rappie	1535	Aged	Brown ..	E. P. McMillan, Eagle Farm
Robin	1168	Aged	Brown ..	P. Barr, Boree Creek, *via* Millmerran
Sandpiper	1609	Aged	Grey ..	E. J. Boldery, Gayndah
Skylark	1610	Aged	Piebald ..	J. E. Grout, Musket Flat, Maryborough
Spark	1611	5	Brown ..	A. A. Stockill, Goomeri
The Black Joke ..	1182	6	Black ..	A. J. Salisbury, Duaringa
Valley Boy ..	1612	6	Chestnut ..	L. A. Matton, Woolooga
Welsh Boy	1518	5	Taffy.. ..	D. J. Crowley, Crowley Vale, *via* Gatton
Young Guinea ..	1169	5	Brown ..	H. H. Ehrlich, Douglas ,*via* Goombungee

TROTTER STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1935-36.

Cedarwood	1170	5	Black ..	G. Ellsden, Pampas
Last Bill	1613	5	Bay	Mrs. A. Gick, 173 Ann street, Maryborough

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1935-36.

Banker	1142	5	Brown ..	A. R. and R. C. Curd, Jandowae
Barney II.	1552	6	Bay	M. Mow, Kurrumbul
Baron Favour ..	1537	5	Bay	J. M. Newman, Caboolture
Baroona Musketeer	1538	5	Chestnut ..	E. Mussig, Yurol, Cooroy
Ben	1584	5	Bay	V. K. Trott, Reid's Creek, Gayndah
Ben Hur	1585	5	Black ..	M. MacDonnell, South Side, Gympie
Black Prince ..	1553	5	Black ..	D. W. Bell, Beebo
Blaze Dale	1206	5	Brown ..	A. W. Law, Kuttabul
Blue Boy	1207	5	Grey ..	A. N. Sunderland, Sunnyside, Mackay
Bluff Wyllie ..	1504	5	Bay	L. Schneider, Kent's Pocket, Boonah
Bold Hero	1506	5	Bay	G. Lee, Calvert
Bonny Clyde ..	1143	6	Bay	A. Grant, Undulla Creek, Tara
Boondandilla ..	1614	6	Brown ..	C. M. Wright and Sons, Ltd., Goondiwindi
Boxer	1586	6	Bay	W. V. Lines, Electra, Pine Creek, Goondoon
Bright Star ..	1587	6	Bay	J. Kennedy, Kumbia
British Pride ..	1554	5	Bay	T. J. Ryan, Freestone
Brown Prince ..	1539	Aged	Brown ..	J. Collins and Sons, care of Moreheads, Ltd., Brisbane
Brown Star ..	1144	5	Brown ..	R. W. Thomson, Hurstvale, *via* Greenmount
Captain	1184	Aged	Bay	C. M. Peacock, Dululu
Captain	1501	6	Brown ..	C. Maas, Waterford
Captain Duke ..	1507	5	Black ..	F. Horne, Springbrook
Carlyle Prairie ..	1145	5	Bay	A. A. Treasure, Brigalow
Charlie Chaplin ..	1146	Aged	Bay	H. J. Barrett, Bruan Park, Tara
Crystal Ball ..	1185	5	Bay	G. Dahlter, Nagoorin
Crystal Hope ..	1508	5	Bay	Handley Bros., Murphy's Creek
Dale	1209	7	Brown ..	E. G. Lascelles, Goorganga, Proserpine
Don	1588	5	Bay	J. Toft, P.O., Bundaberg
Donald George ..	1147	Aged	Bay	F. Hoffmann, Hillside, Farm, Guluguba
Don Bradman ..	1589	5	Bay ..	C. Jeynes, Glastonbury
Dornford Baron ..	1237	6	Grey ..	J. Andrews, Dornford, Bowen
Duke	1186	Aged	Black ..	McCartney Bros., Yaamba
Duke	1187	5	Bay	W. Scantlebury, Theodore
Duke	1148	6	Bay	E. H. Crook, Viola Downs, Wandoan
Duke Dale	1149	5	Black ..	H. J. Knight, Koondai-i Creek, Bell
Edgecombe Prince..	1150	5	Bay	J. W. Ritter, Edgecombe, Mount Tyson
Farmer	1210	5	Light bay ..	A. Hinschen, Acacia Vale, Proserpine
Farmer II.	1211	Aged	Bay	F. J. Muller, Don River, Bowen
Farmer's Glory ..	1509	5	Bay	F. W. Abrahams, Lark Hill, *via* Walloon
Foot Step	1212	5	Bay	W. Schulz, Flaggy Rock
General Chief ..	1510	5	Bay	W. F. Litzow, Tarampa
General Wheeler ..	1213	Aged	Bay	A. McClure, Mirani
Glenlad	1374	5	Bay	D. Dunn, Bruff Hill, Beaudesert
Golden Charmer ..	1511	6	Chestnut ..	A. R. Hanson, Amberley
Great Heir	1512	5	Brown ..	T. H. Green, Milford
Hector	1214	5	Bay	P. Brook, Koumala
Hendon Bill ..	1555	5	Bay	G. H. Clarke, Allora
Highland Grey ..	1215	5	Grey ..	A. Petersen, Homebush road, Mackay
Home Dale ..	1216	Aged	Black ..	Wright and Davidson, Nebo
Isaac	1217	5	Bay	P. S. Brook, Koumala
Jack	1151	5	Brown ..	W. F. McNamara, Tara

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1935-36.—*continued.*

Name.	No.	Age.	Description.	Owner.
John Bright ..	1218	Aged	Bay	E. G. Lascelles, Proserpine
Jondaryan Carlisle	1556	6	Bay	M. Lysacht, Clinton Vale
Jondaryan McIntyre	1557	5	Bay	J. P. Warden, Goondiwindi
Kenneth	1552	6	Bay	F. C. Schubert, Bowenville
Kerrestondale ..	1153	5	Brown ..	P. J. Dukes, Upper Undulla, Tara
King of the Ring ..	1219	5	Bay	T. P. Keilbach, Homebush
Kingsford	1590	Aged	Dark bay ..	J. M. C. Hyde, Tarong road, Nanango
Leo	1591	5	Bay	Ford and Proctor, Coalstoun, Lakes
Lion	1513	5	Bay	J. J. Shine, D. J. Shine and W. Stokes, Fernvale
Lochaber Lad ..	1592	5	Bay	T. Laidler, Mundubbera
Lord Marmion ..	1154	5	Bay	G. G. Wilson, Lilydale, Bell
Lord Wheeler ..	1220	Aged	Bay	A. Williams and Co., Homedale, Nebo
Lord Wheeler ..	1188	5	Bay	C.Q.M.E. Co., Lake's Creek
Major Dale ..	1155	Aged	Bay	D. Keeshan, Goranba
Major Wallace ..	1558	5	Bay	G. Cross, Campbell's Plains, Warwick
Master Gladfield ..	1559	5	Black ..	P. W. Flynn, Clifton
Nelson	1560	Aged	Bay	Scottish Australian Co., Texas
Noble	1221	6	Black ..	J. Adams, Eungella
Noble	1156	5	Brown ..	G. Tennyson, Chinchilla
Noble Premier ..	1593	5	Iron grey ..	J. V. B. Jamieson, Netherby
Nugget	1540	Aged	Bay	B. E. Geary, Kingston
Our Hope	1594	Aged	Bay	P. Booth, Brooweena
Patent	1541	5	Brown ..	G. L. Opperman, Ormeau
Pilot..	1222	5	Brown ..	T. J. Hoey, Sarina
Pip	1223	Aged	Bay	E. G. Lascelles, Proserpine
Plain Huntley ..	1224	5	Bay	F. de Costa, Orkabie
Prince	1189	5	Bay	H. A. McCartney, Kunwarara
Prince	1595	Aged	Bay	E. H. Scotney, Oakwood
Prince	1157	5	Brown ..	Schulz Bros.', Neuve, *via* Haden
Prince	1225	5	Bay	P. S. Brook, Koumala
Prince	1226	Aged	Brown ..	F. Dibben, Mount Marlow, Proserpine
Prince	1542	Aged	Bay	J. H. Gaven, Riversvale, Southport
Prince Dale.. ..	1227	5	Brown ..	A. D. Shannon, Oxford Downs, Nebo
Prince Meadie ..	1596	5	Bay	F. E. Mitchell, Byee, Murgon
Punch	1514	5	Brown ..	O. Reinke, Ashwell, Rosewood
Robin	1543	6	Dapple grey..	M. M. J. Sheehen, Hope Islands, Coomera
Royal	1228	6	Black ..	N. Richards, Carrinyah, Nebo
Royal Hope ..	1565	5	Bay	P. Canavan, P.O., Warwick
Royal Prince ..	1158	5	Bay	W. G. Bidgood, Emu Creek, Crow's Nest
Royal Shepherd ..	1159	5	Bay	C. A. Kahler, Geham
Royal Windsor ..	1597	Aged	Bay	W. Brandon, Tirroan
Sandy Burton ..	1229	Aged	Bay	A. D. Shannon, Oxford Downs, Nebo
Shannon	1230	5	Red roan ..	E. G. Lascelles, Proserpine
Sir Richard ..	1160	5	Bay	J. Armstrong, Chinchilla
Sir Trump	1598	6	Bay	H. C. Paulsen, Mundubbera
Sonoma	1238	Aged	Brown ..	Massey Bros., Sonoma, Collinsville
Star	1544	5	Bay	W. Johnston, Strathpine
State Matthew ..	1161	Aged	Bay or brown	L. H. Corser, Goombi Siding
Statesman	1231	5	Brown ..	Wright Davidson, Nebo
Talgai Refiner ..	1561	5	Black ..	H. Sprott, Talgai West
The Duke	1162	Aged	Bay	G. H. Gazzard, Undulla Creek, Tara
The Intent II. ..	1599	6	Black ..	M. Gould, Nanango
The McIntosh ..	1232	5	Bay	F. de Costa, Orkabie
Tiger	1600	5	Bay	G. M. Gallaty, Gayndah
Trooper Lad ..	1233	6	Bay	C. L. Schilling, Club Hotel, Bowen
True Blue	1615	5	Bay	Dalton Bros.', Spring Creek, Clifton
Tulpin	1234	6	Brown ..	F. Maltby, Box 94, Bowen
Wallace	1601	5	Bay	C. F. Stumcke, Rangeview, Proston
Welford	1163	6	Bay	E. W. Watson, Welford, Cecil Plains
Wharo Pumi Desire	1545	5	Black ..	J. M. Smith, North Otago
Wilangi Lad ..	1190	5	Brown ..	Beak Pastoral Co., Rockhampton
Windsor's Pride ..	1602	Aged	Bay	F. A. Nahrung, Boompa
Woorilla Regal George	1603	5	Bay	Fairymead Sugar Co., Ltd., Bundaberg
Worthy Craig ..	1546	6	Bay	Walsh Bros.', Laravale
Young Banker ..	1235	Aged	Bay	A. H. Tones, Homebush
Young Barron ..	1604	6	Bay	T. Patteson, Walker's Bag, Nanango
Young Barron's Pride	1562	6	Bay	A. G. Hammond, Swan Creek
Young Boom ..	1164	6	Bay	M. J. Ryan, Cambooya
Young Kingsford ..	1515	5	Bay	W. A. and M. Scott, Toogoolawah

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1935-36.

Astor King ..	923	4	Bay	R. Stark, M.P. Creek, Wondai
Banjo	924	3	Chestnut ..	J. Lye, Cania road, Monto
Beauvalette ..	1054	3	Chestnut ..	W. H. Gillham, Nebo
Blue Spear	688	3	Bay	W. P. Casey, Milbong
Brownlie	1039	4	Brown ..	W. H. Smith, Ubobo
Brown Lock ..	689	3	Brown ..	J. Reid, Glamorganvale
Brown Poitrel ..	925	4	Bay or brown	A. G. Cross, Ellesmere, *via* Kingaroy
By Golly	926	4	Bay	F. H. Cockerill, Archookoora

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1935-36.—*continued.*

Name.	No.	Age.	Description.	Owner.
Cylis	1078	4	Brown	R. Pomeroy, Ruthven street, Toowoomba
Don's Pride	927	4	Brown	C. S. Svensson, Ashfield, Bundaberg
Duinatic	687	4	Bay	J. Drinan, Wallaville
Emble Mat	928	4	Grey	W. Elsebach, Gayndah
Emble So	929	4	Bay or brown	L. Wedemeyer, Eidsvold
Glengarry	1040	4	Brown	W. C. Dickinson and Sons, Boynedale
Gun Mark	887	4	Black	T. Phelan, Gladfield
Hebronze	735	3	Bay	J. T. Scrymgeour, Netherby, Warwick
Jackoli	1041	3	Brown	Coochin Estates, Camboon
King Leo	690	3	Brown	J. Stenzel. Carney's Creek
Loch Syce	930	4	Bay	A. A. Petrie, Madoora, Gayndah
Loud Report	691	3	Brown	J. Betts, Junr., Boonah
Morning Glory	931	3	Brown	W. Barrett, Bella Vale, Nanango
Mutiara	932	4	Bay	A. W. Jarvis, Monto
Petition	933	3	Bay	T. J. Downing, Gooroolba
Real Felt	692	4	Bay	R. Mahaffey, Grantham
Sarcheson	934	3	Iron grey	D. A. Proctor, Kalliwa, Mount Perry
Sarlu	1042	3	Iron grey	C. A. Becker, Paranui, Theodore
Sea Laddie	693	3	Brown or black	T. J. Ford, Gatton
Serf King	1055	3	Chestnut	A. T. Wellby, Glenella, Mackay
Sir Dignity	888	4	Chestnut	C. A. Rae and M. Doyle, Bungunya
Sir Sydney	1056	4	Bay	G. Massey, Sonoma, Collinsville
South Kerman	694	3	Chestnut	J. H. Heck, Glamorganvale
St. Hero	984	4	Chestnut	J. A. Bridge, Tara
The Mikado	983	5	Bay	Rawdon, Briggs and Co., Mount Perry (Provisional)
Thorm	1057	3	Bay	E. Thormahlen, Bowen
Tooloomba	1043	4	Bay	J. W. Mylrea, Kunwarara
Townie	935	Aged	Bay	S. B. Trigger, Hopewell, Lakeside (Provisional)
Treken	685	4	Chestnut	S. C. Luck, Warwick
Trent Bernie	936	3	Chestnut	J. Frame, Inverlaw, Kingaroy
Turkish Prince	937	4	Bay	E. C. Zillmann, Wallaville
Warrigal	985	3	Chestnut	J. F. Lowien, Cooyar East
Warwick Bachelor	986	3	Brown	F. J. C. Martin, Kumbarilla

PONY STALLIONS CERTIFICATED FOR THE YEAR 1935-36.

Name.	No.	Age.	Description.	Owner.
Ace of Hearts	978	3	Chestnut	C. E. Pascoe, Ceratodus
Ankor II.	919	3	Dark grey	W. Gilmore, Temuka, Allora
Basra	920	3	Bay	R. A. Howell, Killarney
Black Pride	724	3	Black	A. Kubler, Boonah
Bonnie Boy	979	4	Bay	C. Jose, New Moonta
Bonny Lad	725	4	Roan	I. G. Bonnie, Rosewood
Boonah Jewel	726	4	Black	G. C. Kirchner, Boonah
Bright Lad	682	3	Bay	C. Cotter, Hargreave street, Ipswich
Bright Laddie	1035	3	Bay	Ziesemer Bros.', Bongeen
Bright Laddie II.	727	3	Black	V. C. Schelback, Boonah
Circus	736	4	Skewbald	W. Rudd, Mudgeeraba
Danny Boy	921	4	Bay	J. Flynn, Clifton
Darby	980	3	Chestnut	L. J. Mackaway, Goomeri
Friskie's Pride	728	3	Black	P. Burnell, Boonah
Golden Laddie	729	3	Chestnut	W. A. Embrey, Tallegalla
Johnny	981	4	Cream	F. McD. Hooke, Boowoogum
La Cigale	922	4	Bay	R. C. Cooke, Upper Pilton
Little Sam	982	3	Black	E. O. Althouse, Cloyna, Murgon
Prince Saud	684	4	Blue grey	O. Ridge, Windsor, New South Wales
Silver King II.	731	3	Taffy	E. Grace, Maroon
Spotlight	1036	4	Black	H. V. Farquharson, Newtown, Toowoomba
Tim	1037	3	Black	A. Tame, Kulpi
Tom Thumb	1058	4	Black	S. McKay, Pinnacle
Treasure	737	4	Light chestnut	V. W. Francis, Cooran
Wildfire	731	3	Chestnut	A. Moore, Crowley Vale, *via* Gatton

TROTTER STALLIONS CERTIFICATED FOR YEAR 1935-36.

Name.	No.	Age.	Description.	Owner.
Abdul A. Meier	1038	4	Brown	H. G. McKnight, Gowrie Junction
Brown Bells	732	4	Brown	G. S. Hooper, Mutdapilly
Direct Dean	733	3	Brown	C. A. J. Tillack, Hatton Vale
Great Audo	738	3	Bay	W. E. Scrivener, Kitchener road, Kedron
Monto Wilkes	1044	4	Black	A. Thomasson, The Caves

DRAUGHT STALLIONS CERTIFICATED FOR YEAR 1935-36.

Name.	No.	Age.	Description.	Owner.
Aerial Mail	1045	3	Bay	Coochin Estates, Camboon
Allora Crystal	987	4	Brown	M. Lysaght, Milmerran
Andrew Lad	988	4	Brown	W. Biegel, Rywung
Arraglen	938	3	Bay	Pownall and Pownall, Mount Perry
Attraction	989	3	Bay	T. A. Gaske, Chinchilla
Baron Fancy	990	4	Bay	S. Otto, Burn Burn Creek, *via* Crow's Nest

Draught Stallions Certificated for Year, 1935-36—*continued.*

Name.	No.	Age.	Description.	Owner.
Baron's Pride ..	889	4	Bay	F. Mundey, Gladfield, *via* Warwick
Beau Ideal	939	4	Bay	A. H. Greenup, Echo's Bancroft, *via* Gladstone
Beau Laddie ..	695	3	Bay	S. J. Draper, Stoney Creek, Woodford
Black Prince ..	1046	4	Black ..	L. C. Walker, Bingera Cattle Station, Bundaberg
Black Prince ..	991	3	Black ..	W. J. A. Prasser, Kulpi
Black Prince ..	992	4	Black ..	J. Simmons, Coo-ee Ville, Milmerran
Blaze	993	4	Bay	E. Armstrong, Oakwood, Bell
Blucher	1047	3	Brown ..	J. E. Holland, Wycarbah
Blue Prince.. ..	1059	4	Liver chestnut	S. C. Zahmel, Finch Hatton
Bold Boy	1505	5	Bay	L. A. Armstrong, Rosewood (Provisional)
Bold Laddie ..	696	4	Bay	T. Armstrong, Rosewood
Bold Noble ..	697	4	Brown ..	V. Voigt, Glamorganvale
Bold Prince ..	698	4	Bay	G. A. Heise, Minden
Bonnie Intent ..	940	3	Bay	W. Elsebach, Gayndah
Bonnie's Male ..	699	3	Brown ..	E. Scells, Mount Alford
Bounce	890	4	Bay	Percy Canavan, P.O., Warwick
Bounce	1075	Aged	Bay	B. J. D. Clark, Range road, Sarina (Provisional)
Brilliant Master ..	941	4	Bay	R. Stark, M.P. Creek, Wondai
Brilliant Treasure ..	739	3	Bay	A. A. Stoke's, Abbotsford, Victoria
British King ..	942	3	Bay	R. Kahler, Deep Creek, Gympie
British Prince ..	943	3	Bay	C. F. Draheim, Crownthorpe, via Murgon
British Prince ..	700	4	Bay or brown	M. O'Neill, Peak Crossing
Brooklyn Keynote's Dignity	891	4	Bay	T. J. Brosnan, Killarney (Provisional)
Brooklyn Keynote's Sport	740	3	Brown ..	F. Powell, Richmond, Victoria
Brown Bob ..	1060	4	Brown ..	F. J. Simonsen, Sarina
Brown Carlyle ..	994	3	Bay	Alexander Estates, Inverai
Bruce	1061	3	Bay flecked ..	P.C. Brooks and Co., Sarina
Burrundale George	944	3	Bay	J. E. Stanton, Goomeri
Cambyses	741	3	Brown ..	Moore Hunter Estate, Hawera, New Zealand
Campbell Prince ..	701	3	Bay	H. A. Glover, Dayboro'
Captain	945	4	Bay	H. H. O. Kopp, Emu Creek, Degilbo
Captain	946	3	Bay	Mulcahy Bros., Nanango
Captain Keynotes ..	742	4	Bay	F. Powell, Richmond, Victoria
Captain Wallace ..	702	3	Bay	W. E. Houston, Blackbutt
Captain Wallace ..	947	3	Bay	A. Perrett, Coolabunia
Carlyle	995	4	Bay	M. J. Sommer, Goombungee
Carlyle Boy ..	996	3	Bay	F. and N. Alexander, Inverai
Carlyle Pet ..	997	3	Bay	Alexander Estates, Inverai
Carlyle's Hero ..	948	3	Bay	R. Maudsley, Murgon
Carrick Flash Chevalier	743	4	Bay	F. E. Barton, Rhodesia, Durong
Cedric	998	3	Black ..	E. C. Stark, Pineland, via Crow's Nest
Chief	999	3	Brown ..	J. A. Hick, Wyoming, Jackson
Chrystal	1074	4	Brown ..	N. R. Trousdell, Crow's Nest
Clematic Flash Mac	1076	3	Brown ..	J. M. Newman, Caboolture
Clyde	892	4	Black ..	J. S. O'Leary, Fontainbleu, Leyburn
Clyde Hill Intent ..	704	4	Bay	J. Lehmann, Coolana
Clydemere	1000	4	Brown ..	S. Hartwig, Goomville, *via* Pechey
Crown Duke ..	1001	4	Bay or brown	H. Dornbusch, Cross Hill, *via* Oakey
Crystal Glen ..	893	3	Bay	F. J. Gay, Wheatvale
Crystal King ..	949	3	Brown ..	J. B. Edwards and Sons, Kingaroy
Crystal's Pride ..	894	4	Bay ..	F. Watts, Freestone
Cub	950	4	Bay	G. A. Pollock, Mt. Kolan, *via* Avondale
Culverthorpe Favourite Hero	1002	3	Bay or brown	T. W. Caldicott, Vandilla
Dale Square ..	1003	3	Brown ..	B. McGovern, Greenmount
Damsel's Lad ..	705	3	Bay	A. Miller, Stanmore, *via* Woodford
Danny	1004	3	Bay	L. Lloyd, Wandoan
Darwin	951	4	Bay	C. Cavanagh, junr., Kybong, Gympie
Dobin	1005	4	Bay	S. Marriage, Narko
Dollfuss	686	3	Bay	M. J. Brosnan, Clifton
Donald Wallace ..	952	4	Bay	D. Birch, Memerambi
Duke	1062	4	Chestnut ..	G. F. Hicks, Glenella, Mackay
Dunure Intent ..	1063	4	Black ..	A. Williams and Co., Homevale, Nebo
Earl Marshall ..	1064	4	Bay	G. W. Orchard, Parapi
Fairbal Gaiety's Best	895	3	Bay	W. S. McKee, Clifton
Farleton Bon Voyage	1006	4	Bay or brown	Jondaryan Estates, Jondaryan
Farleton John ..	1007	3	Brown ..	H. Handley, Pampas
Farmer's Favourite	1008	3	Bay or brown	F. Wockner, Newington, *via* Jondaryan
Fashion Prince ..	896	4	Bay	E. Dwan, Deuchar
Gay Lad	744	4	Bay	G. White, Petrie
General Dale ..	706	3	Brown ..	F. Weier, Hatton Vale
Glen II.	1009	3	Bay	J. Tennyson, Chinchilla
Glen Donald ..	1010	3	Bay	Ada Perina and Sons, Glenmore, Crow's Nest
Glenlea's Pride ..	746	3	Brown ..	R. Stokes, Collingwood, Victoria
Glen Pedder Pride	745	3	Bay	R. Stokes, Collingwood, Victoria
Glenroy	953	3	Brown ..	B. H. Lehmann, Bundaberg
Grand Major ..	954	4	Bay	C. E. Pascoe, Ceratodus
Greenlea Favourite	747	4	Bay	J. M. Smith, N. Otago, New Zealand
Grove King ..	1048	3	Bay	Beak Pastoral Co., Rockhampton

DRAUGHT STALLIONS CERTIFICATED FOR YEAR, 1935-36—*continued.*

Name.	No.	Age.	Description.	Owner.
Hermitage Lad ..	897	4	Bay	H. H. Gillespie, Hermitage
Hero	955	4	Chestnut ..	J. M. Taylor, Childers
High Degree ..	748	3	Brown or black	J. Hamilton, Forest Hill
Highfield Challenger	1049	4	Bay	R. H. Aplin, Biloela
Highland Lad ..	1011	4	Bay	E. H. Volker, Preston
Intent	1065	4	Bay	Land Bros., Pastoral Co., Etonvale
Intent's Laddie ..	1012	4	Bay	J. V. Willis, Meringandan
Irton Lustre ..	707	4	Bay	West Moreton Horsebreeders' Association, Laidley
Jelbyn Jock ..	749	3	Bay	Walsh Bros., Laravale
Jondaryan Darnley	956	3	Bay	C. and S. J. Jenkins, Dickabram
Jondaryan Duke ..	1013	3	Bay	G. W. Hartmann, Bowenville
Jondaryan Janitor..	957	4	Bay	G. G. Walker, Tarong road, *via* Nanango
Jondaryan Mac ..	708	4	Brown ..	B. G. Kerle, Minden
Jondaryan Worthy John	898	3	Bay	W. A. Deacon, Allora
Jondaryan Worthy Minstrel	1014	3	Bay	W. W. J. Lloyd, Harrow
Jondaryan Worthy Sheriff	1015	3	Bay	Mrs. Eva B. A. Armstrong, Curzon street, Toowoomba
Kerlock	709	3	Black ..	R. E. A. Schafferius, Ingoldsby
Kerrston Again ..	710	3	Black ..	P. Ryan, Viewlands, Gatton
Kerrston's Viceroy	958	3	Black ..	W. D. Porter, Kumbia
Kimbar Mail Boy Jack	750	3	Bay	S. Wendt, Chamber's Flat, Kingston
King George ..	1016	3	Bay	L. Hogarth, Cambooya
Lad	1050	3	Black ..	A. Nightingale, Goovigen
Laddie	1017	3	Bay	L. A. Ruhle, Motley
Lawson's Choice ..	876	3	Brown ..	O. Ridge, Windsor, New South Wales.
Lincoln	1066	3	Brown ..	F. O. Schmidt and G. Bonaventura, Eton
Lyon	899	3	Bay	M. J. McMahon, Freestone
Major Dale ..	711	4	Bay	C. A. Kanofski, Grandchester
Major Lace ..	960	3	Black ..	H. Seiler, Tingoora
Major Wallace II. ..	877	4	Bay	F. A. Doeblien, Yatala
Major Wyllie ..	712	3	Bay	J. H. Summerville, Kholo
Marvel	713	4	Bay	H. Wood, Mt. Berryman
Master Carlyle ..	1018	3	Bay	F. Wood, Inverai
Master Wallace ..	961	3	Bay	G. S. Lee, Broadmere, Nanango
Master Wallace ..	900	3	Bay	T. O'Dempsey, Freestone
Master Wheeler ..	1067	4	Black ..	F. Bundesen, Eton Range
Max	959	3	Bay	S. B. Anderson, Tingoora
Monte Carlo ..	901	3	Bay	T. C. Hoffmann, Gladfield, Warwick
Mountain View ..	1051	3	Bay	E. A. Russell, Thangool
New Hope	1019	4	Bay	E. Ehrich, Greenmount
Ngaio Juvenal ..	878	3	Brown ..	Moore Hunter Estates, Hawora, New Zealand
Nigger	1020	3	Black ..	C. Dunemann, Murra Murra, Crow's Nest
Noble Hero ..	1021	3	Brown ..	E. Ehrlich, Murra Murra
Noble King ..	1022	3	Brown ..	M. J. O'Neill, Hurstvale
Noble Lad	902	4	Roan ..	W. J. Ryan, Upper Freestone
Nobleman	1024	4	Blue Gray ..	J. Frizzell, Southbrook
Norwood	879	3	Black ..	J. M. Smith, N. Otago, New Zealand
Oakflat Chancellor..	962	4	Bay	F. E. Mitchell, Byee, Murgon
Peel River Monarch	1024	3	Bay	J. C. Bligh, Brookstead
Pinevale Mainmast	1025	3	Black ..	Jondaryan Estates, Jondaryan
Premier's Pride ..	714	4	Bay	W. P. Kelly, Silverdale, Kalbar (Provisional)
Pride of Dartmoor..	1026	4	Bay	Mrs. E. H. Egan, Mt. Tyson
Pride Shepherd ..	1027	4	Bay	W. F. Welke, Kleinton
Prince	715	4	Bay	R. E. Turpin, Lowood
Prince	903	4	Bay	J. W. Bickers, Kurrumbul
Prince	1068	4	Chestnut ..	A. J. Deicke, Proserpine
Prince	1069	4	Chestnut ..	J. McFarlane, Eton
Prince Almond ..	716	4	Chestnut ..	R. Farrow, Dayboro'
Prince Campbell ..	717	4	Bay	J. McKenzie, Dayboro'
Prince Dale ..	880	3	Bay	W. Rudd, Mudgeeraba
Prince Dale ..	963	3	Bay	F. C. Rekow, Bundaberg
Prince Henry ..	1028	4	Brown ..	F. D. Lipp, East Greenmount
Prince Isles ..	964	4	Bay	G. A. Steinhardt, Murgon
Prince Roy ..	1029	3	Bay	P. G. Ruhle, Motley
Prince Thomas ..	1030	4	Brown ..	A. Orr, Aubigny
Prince Valley ..	965	4	Chestnut ..	Aplin Bros., Gin Gin
Punch	1070	3	Bay	J. M. McCane, Gumlu
Punch	1052	3	Bay	A. Thomasson, The Caves
Rajah	1071	4	Chestnut ..	H. Ivers, Rosella
Rare Champion ..	718	3	Bay	H. G. A. Bartholomai, Boonah
Revenue	718	4	Bay	P. Connole, Helidon
Rielly	904	4	Bay	J. Nolan, Glengallon, *via* Warwick
Ripplevale Treasure	881	4	Bay	R. Stokes, Collinwood, Victoria
Roan Tom	1053	4	Roan ..	J. B. Shannon, Rockhampton
Robin	720	3	Bay	N. V. Behrendorff, Boonah
Robin	966	4	Bay	H. Kennedy, Kumbia
Rob Roy ..	721	3	Bay	H. Williams, Blackbutt
Royal Banker ..	905	3	Black ..	Hart Bros., Headington Hill, Clifton
Royal Dale ..	882	4	Bay or brown	C. A. Sproxton, Maleny

Draught Stallions Certificated for Year, 1935-36—*continued.*

Name.	No.	Age.	Description.	Owner.
Royal Glencoe ..	906	4	Brown ..	J. Thompson, junr., Stanthorpe
Royal Lamington ..	967	3	Black ..	A. Birch, Murgon
Royal Shepherd ..	1031	3	Bay	W. F. Peters, Maclagan
Royal Top	907	3	Bay	A. McKechnie, Stanthorpe
Shamrock	908	3	Bay	M. Bourke, Yangan
Shepherd Hill Prince Charlie	968	4	Bay	R. B. Jefferies, Johnstown, Nanango
Shepherd's Robin ..	1032	3	Brown ..	D. Polzin, Plainby, *via* Crow's Nest
Sir Charles	969	4	Bay	V. C. Potter, Speedwell, *via* Proston
Sir Walter Sampson	970	3	Bay	R. S. McKenzie, Wallaville
Snip	1072	4	Bay	Mrs. S. Stanbury, Bowen road, Proserpine
Sonny Baronet ..	909	3	Bay	J. T. Boal, Loch Lomond, Warwick
Special Mack ..	1077	5	Bay	D. G. McIntosh, Tansey, Goomeri
St. Helen's Captain Windermere	971	4	Bay	A. Sippel, Redgate, Murgon
Stepford Belted Knight	910	5	Bay	J. M. Hagenback, Freestone (Provisional)
Stepford Blockadge	911	3	Brown ..	V. C. Cutmore, Mt. Sturt
Sterling Slade ..	883	3	Black ..	F. Powell, Richmond
Talamoniac ..	912	4	Bay	Evans Bros., Gooray
Talgai Model ..	913	3	Bay	J. J. Rynne, Goomburra
Toby	972	4	Bay	T. Clark, Weitalaba
Top Halls	722	4	Bay	A. Wienholt, Washpool Farm, Kalbar
Ulupua Carl ..	1033	3	Bay or brown	A. A. Treasure, Br·galow
Viron	973	3	Bay	F. R. Briggs, Mt. Perry
Wallace	974	3	Bay	W. H. Lamke, Gundiah
Wallace Monarch ..	884	4	Bay	J. Murray, Beaudesert
Wickside Brilliant Son	975	3	Bay	W. G. Currant, junr., Gunalda
Wildash Pride ..	976	3	Black ..	W. J. Borchert, Murgon
William Wallace ..	915	3	Bay ..	J. Sprott, Ellenthorpe
William Mac ..	885	4	Roan ..	McAulay Bros., Maroochy River
Windermere Cellus	977	4	Bay	L. C. Walker, Bingera Cattle Station
Worthy Carlyle ..	734	5	Brown ..	J. Lehmann, Coolana (Provisional)
Wyaga	916	4	Bay	Munro and Turner, Goondiwindi
Yaccum	1073	4	Bay	J. Renwick, Proserpine
Young Douglas ..	886	3	Bay	R. Stokes, Collingwood, Victoria
Young Hero ..	723	4	Brown ..	G. Reinke, Minden
Young Intention	917	3	Bay	D. I. Free, Elphinstone
Young Ivanhoe ..	1034	4	Black ..	J. N. Kahler, Geham
Young Scotchman	918	4	Chestnut ..	J. T. Boal, Loch Lomond, Warwick (Provisional)

LIST OF REJECTED STALLIONS.

List of Stallions in respect of which Certificates of Registration were refused, on account of either lack of type and/or conformation, lack of size, or unsoundness during the year 1935-36. These horses are prohibited from service, either public or private:—

Blood Stallions Rejected during 1935-36.

Name.	No	Age.	Description.	Owner.
Brownie	..	Aged	Bay	J. McConville, Swan Creek
De Letle	..	5	Bay	W. C. H. Dingle, Wolca
Gallaphil	..	Aged	Bay	S. A. Clapham, Kumbia
Mintoi	..	6	Bay	F. T. Foxley, Lamington
Nettah	..	3	Chestnut ..	E. Hatten, Chinchilla
Pride	..	3	Bay	A. L. Pullinger, Station street, Helidon
Pyramid	..	5	Bay	A. Perrett, junr., Elgin Vale, Nanango
Say Lever	..	4	Bay	F. W. Grimes, Saddle Top Mail, *via* Clifton
Sir Sarchadon ..	..	Aged	Chestnut ..	M. S. E. Hewitt, Glenmoral
Tam O'Shanter ..	..	3	Brown ..	J. Ball, Kudo
Tonkaway	..	3	Bay	H. S. Pocock, Boonah
Unnamed	..	5	Bay	S. S. Hobbs, Moogerah, Kalbar
Walla Spear ..	..	4	Bay	G. Chapman, Calliope
War Leo	..	6	Brown ..	G. Scott, Mt. Elliott, *via* Woodhill
Wedgebah	..	Aged	Bay	A. N. Brady, Goondiwindi
Xmas	..	6	Bay	J. Jorgensen, Wooroolin

PONY STALLIONS REJECTED DURING YEAR 1935-36.

Name.	No.	Age.	Description.	Owner.
Joker	..	3	Brown	T. H. Saville, Greenmount
Laddie	..	5	Iron grey	S. J. Singleton, Boonah
My Boy	..	Aged	Bay	R. Bracken, Maryvale
Peter	..	3	Skewbald	A. N. Rodd, Glenvale, Toowoomba
School Boy	..	Aged	Bay	J. Mullins, Mill Hill
Silver King	..	Aged	Grey	W. H. O. Smith, Ceratodus
Tarcoola	..	3	Brown	J. Sandemann, Aratula
Wifler	..	3	Chestnut	M. T. Clarke, Tara

DRAUGHT STALLIONS REJECTED DURING THE YEAR 1935-36.

Name.	No.	Age.	Description.	Owner.
Baby Austin	..	3	Bay	J. Hardy, Eukey
Bob	..	Aged	Bay	T. Nolan, Gladfield
Booming	..	Aged	Black	L. Duff, senr., Tingoora
Briton	..	3	Brown	G. Wilkins, Mt. Gee's Creek, *via* Limevale
Bugler	..	..	Bay	C. R. Banditt, Milford
Captain	..	3	Chestnut	Muspratt Bros., Littlemore
Carlie	..	5	Bay	J. Nass, Preston
Cavalier	..	5	Bay	W. Jacob, Gladfield
Content	..	4	Roan	W. King, Clintonvale
Culverthorpe High Regard	..	3	Bay	S. B. Trigger, Lakeside
Duncan	..	Aged	Bay	F. G. Dumma, Kuttabul
Duncanson	..	3	Bay	Dr. A. Horn, Toowoomba
Fairfield Prince	..	4	Black	Mrs. E. Thomson, Calliope
Fairhill Young Champion	..	Aged	Bay	J. Brownlie, Junabee road, *via* Warwick
Hopeful	..	4	Chestnut	J. A. Bradley, Dayboro'
Iron Duke	..	5	Grey	A. E. Missen, Clifton
Jack	..	4	Bay	A. J. Ferris, Wondai
Jacko	..	4	Brown	T. J. Barton, Plainby
Jim	..	Aged	Bay	E. H. Horton, Chatsworth
Josh	..	Aged	Bay	J. L. Dickson, Gelobera
Kerr Boy	..	3	Brown	F. O. Jackwitz, Blenheim
Lord Elphinstone	..	Aged	Bay	A. Williams and Co., Homevale
Lucky Bill	..	Aged	Black	L. W. Horne, Takura
Nigger	..	Aged	Black	A. A. Reinke, Hivesville
Noble	..	Aged	Black	N. Warhurst, Woolooga
Nuggett	..	5	Bay	M. Roebeck, Rockside
Nuggett	..	Aged	Grey	C. Ashcroft, Alligator Creek
Paisley	..	3	Black	J. H. Litzow, Chinchilla
Prince	..	3	Bay	E. and W. J. Ensbey, Glenview, *via* Mooloolah
Prince	..	4	Bay	C. Head, Yangan
Prince	..	3	Bay	R. J. Inwood, Boodua
Prince	..	4	Bay	J. C. Evans, Moola
Punch	..	5	Bay	W. J. Barnes, Crow's Nest
Punch	..	3	Bay	E. Hawkins, Widgee
Royal Pride	..	4	Iron-grey	J. A. Ramsay, Upper Freestone,
Royal Prince II.	..	5	Bay	G. S. Mant, Brooweena
Royal Salute	..	6	Bay	T. Smith, Nanango
Sapphire	..	6	Grey	C. Davis, North Gooburrum
Sergeant Wallace	..	4	Bay	J. Upritchard, Blenheim
Shepherd Lad	..	3	Bay	J. V. Willis, Meringandan
Silver King	..	5	Chestnut	W. F. Clayton, Yeppoor
Son William	..	4	Bay	G. A. Finch, Canungra
Studleigh Premier Lad 2nd	..	4	Bay	E. Turkington Pilton road, *via* Clifton
The Pride	..	Aged	Bay	F. Turner, Chinchilla
———	..	3	Bay	T. Webb, Brigalow
———	..	3	Chestnut	J. R. Smith, Kerry
———	..	5	Bay	J. B. Pennell, Kalbar
———	..	Aged	Brown	J. Muir, Blackbutt

PLATE 304.
Stoney Creek Falls, near Cairns, North Queensland.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled for the month of October, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Trevor Hill Mayflower	G. Gwynne, Umbiram	6,953·98	258·773	David of Corunna
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Euroa Princess 3rd	H. L. Lindenmayer, Mundubbera	8,132·54	294·868	Swagman of Clonagan
Palmatt's Honeycake	Rex Tweed, Kandanga	6,170·35	271·303	Glengallon Major
Happy Valley Valaree	R. R. Radel, Coalstoun Lakes	6,772·08	268·296	Burradale Emperor
JERSEY.				
MATURE COW (OVER 5½ YEARS), STANDARD 350 LB.				
Glenview Lady Lynn of Woodbine	F. P. Fowler and Sons, Coalstoun Lakes	7,788·25	457·693	Retford Thorn's Viscount
Trecarne Bertha 5th	T. A. Petherick, Lockyer	7,186·27	388·657	Trecarne Sultan
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
College Stella	A. L. Walker, Dawn	7,413·05	389·703	Bremerside Renown
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Majesty's Lavender of Brooklands	W. Bishop, Kenmore	8,832·45	357·098	His Majesty of Dalebank
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Inasfayl Noble Girl	McGeechan Bros., Kairi	7,185·6	346·986	Inasfayl Wyandotte's Noble
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
White Rose of Hamilton (365 days)	J. Wilton, junr., Raceview	9,812·18	654·07	Retford May's Victor
Dawn Noble's Filibet	A. L. Walker, Dawn	4,893·5	261·816	Noble of Fairview
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Lermont Pearlette	J. Schull, Oakey	5,128·56	297·263	Trecarne Fernlea
Glenview Sunray	F. P. Fowler and Sons, Biggenden	5,770·97	295·605	Carlyle Larkspur Empire
Trinity Fancy Star (270 days)	J. Sinnamon and Sons, Moggill	4,852·82	286·497	Some Hope
Trinity Wedding Bell	J. Sinnamon and Sons, Moggill	5,302·5	254·728	Some Hope
Glenview Blossom	W. S. Kirby, Byrnestown	4,396·79	254·041	Glenview Goldfinder
Glenview Lark	F. P. Fowler and Sons, Biggenden	3,995·17	230·266	Glenview Goldfinder

PLATE 367.

On the road from Yungaburra to Lake Barrine, Atherton Tableland.

PLATE 300.—MECHANICAL LOGGING IN A HOOP PINE FOREST

Unprecedented activity in logging on Crown forests during the year resulted in sales amounting to 143,000,000 super. feet. [*Photo. J. A.* [illegible]

Plate 307.

Mill Logs of the Future.

An eleven-year-old plantation of Pine, one of the most important species in the softwood planting programme of the Forestry Service. 13,481 acres of plantation of all species have been established in Queensland.

[Photo. by J. A. Lunn.

PLATE 308.

A YOUNG HOOP PINE PLANTATION, THE GROWTH OF ELEVEN YEARS.

[*Photo. by J. A. Lunn.*

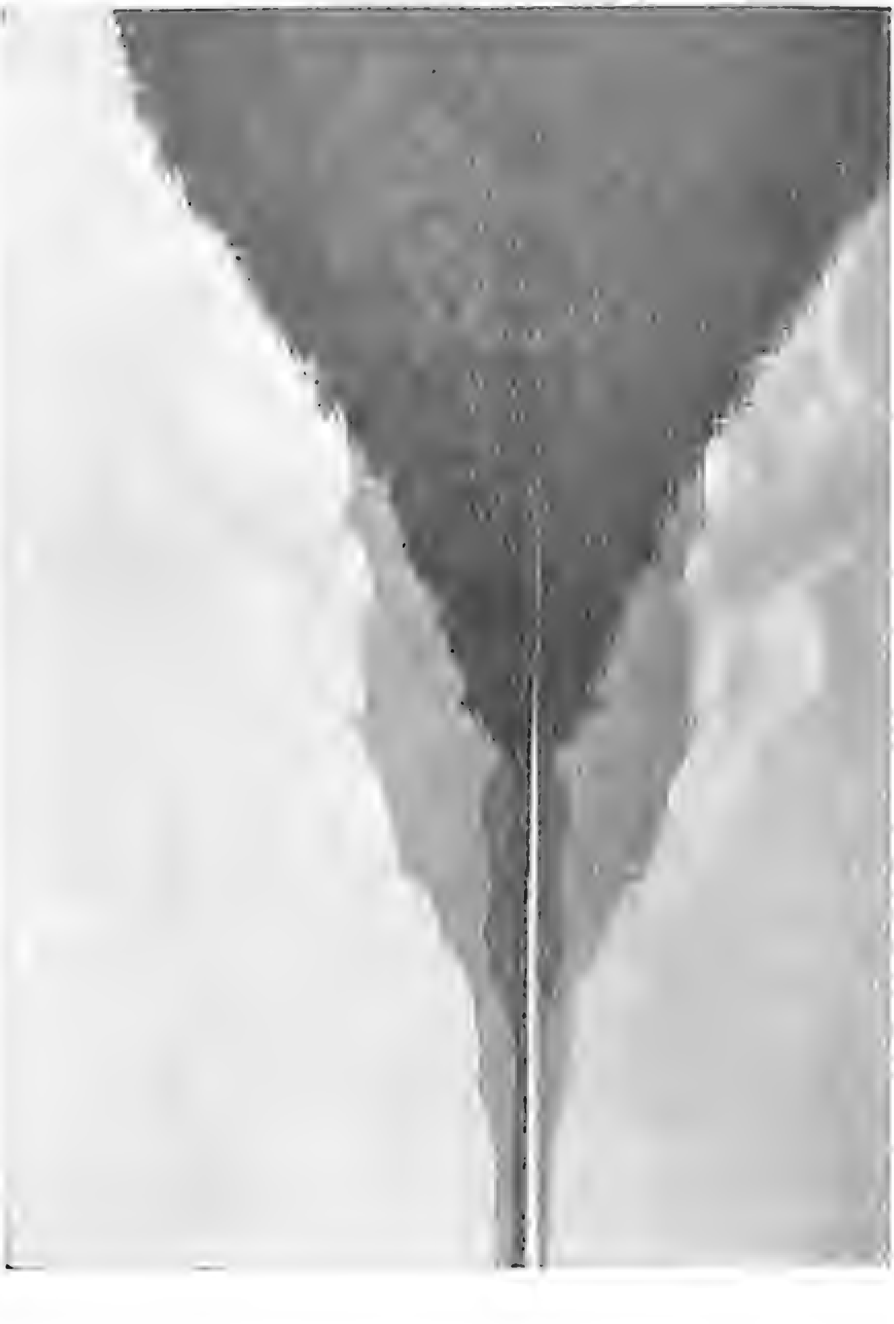


PLATE 309.

THE SCENIC BEAUTY OF QUEENSLAND'S NATIONAL PARKS IS ATTRACTING GREATER ATTENTION EACH YEAR.

A view of Hinchinbrook Island, the whole of which has been declared a National Park by the Government.

[*Photo. Queensland Government Tourist Bureau.*

PLATE 310.

LOGS FOR VENEER MANUFACTURE, NORTH QUEENSLAND.

An exceptionally large walnut log being handled preparatory to being sliced into veneers. The Queensland plywood and veneer industry was most active in 1934-35, the estimated increase in output as compared with 1933-34 being 50 per cent.

[*Photo. by courtesy Telegraph Newspaper Co., Ltd.*

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Milky Cotton Bush Poisonous to Stock.

E.G.L. (Byrnestown, Gayndah Line)—

The specimen represents the Milky Cotton Bush (*Asclepias curassavica*), a very common weed in Queensland. It favours creek banks and similar situations. The plant has been proved by feeding tests to be definitely poisonous to stock, but our experience is that stock rarely eat it to any great extent. Its eradication, of course, is recommended.

Burr Trefoil.

J.M. (Eidsvold)—

The specimen represents burr trefoil (*Medicago denticulata*). This trefoil should do well in your district, as it is one of the most widely spread in the State, and has a wide range of climatic and soil conditions. It is an annual germinating during winter or spring rains, growing through the late winter and spring, and dying off about the end of October and early November. Even when the plants are drying off, or practically dead, the pods which are still left make a valuable fodder.

Barley Mitchell Grass.

R.N.T. (Eulo)—

The specimen forwarded represents *Astrebla pectinata*, barley Mitchell. Four species of Mitchell grass are found in Queensland. Of these I think the commonest is *Astrebla lappaceæ*, the curly Mitchell.

A Valuable Legume (*Alysicarpus vaginalis*).

F.F. (Ingham)—

The specimen is a legume and has been determined as *Alysicarpus vaginalis*. This is fairly common in Queensland and the Northern Territory, although it is not confined to this country, spreading through New Guinea and the Malayan Archipelago to the Philippine Islands. It is an exceedingly valuable fodder and a legume worth encouraging. Dr. Gilruth told us that when he was Administrator of the Northern Territory he found this plant about Darwin, and by fostering it it improved very greatly the carrying capacity of his cow paddock. The plant seeds very heavily, but does not spread to the same extent as the ''wild lucerne'' (*Stylosanthes sundaica*) common in North Queensland. ''Wild Lucerne'' spreads by means of the little hooks on the ends of the pods, i.e., the seedpod, or the last joint of it at least, clings to the feet of animals, and in this way is distributed widely. A similar plant in South Queensland is the burr trefoil which owes its spread in comparison with other clovers and trefoils to the hooks which are on its small twisted pods.

Candle Nut.

A.E.G. (Brisbane)—

The specimen represents the candle nut (*Aleurites moluccana*), a native of the rain forests or jungle of North Queensland, and it is found also on the islands of the Pacific and throughout the Malayan Archipelago. The nuts are edible, but they do not seem to agree with all stomachs. In some cases we have known them to cause purging and vomiting, which may be due to the oil in them being a bit rancid. The seeds are very rich in oil, and the name ''candle nut'' arises from the fact that in the Pacific the nuts are strung together in the form of a candle. The dried nuts burn for some time, but give off a thick black smoke. The oil is a drying oil, and could be used in soapmaking, varnish manufacturing, etc., but it is not equal to the oil of the allied *Aleurites Fordii*.

Horseradish Tree.

E.R.A. (Bowen)—

The specimen is the horseradish tree, *Moringa pterygosperma.* The name, horseradish tree, comes from the fact that in India the beans are used as a substitute for the European horseradish. The young pods are said to be used in that country as a culinary vegetable and to make a good substitute for asparagus. The flavour of the pods or beans varies very considerably from bitter to quite sweet. Fortunately, you evidently possess one of the latter type. We were quite interested in your remarks about animals being fond of the pods.

Countries of Origin of Some Well-known Grasses.

O.C.H. (Berrembea, via Bundaberg)—

Wimmera Rye grass (*Lolium rigidum*) is a native of the Mediterranean region, i.e., Southern Europe, North Africa, and Western Asia. Perennial Prairie grass (*Bromus marginatus*) is a native of British Columbia and western United States. White Clover (*Trifolium repens*) is a native of Europe and temperate Asia. Cocksfoot (*Dactylis glomerata*) is a native of Europe and temperate Asia. Italian Rye grass (*Lolium multiflorum*), same as Wimmera Rye grass.

Wild Tobacco.

D.M.C. (Mackinlay)—

The specimen represents the wild tobacco (*Nicotiana suaveolens*). Reports concerning the toxicity of this plant vary very considerably. The late Dr. J. M. Petrie, who did a great amount of work on the chemistry of Australian poisonous plants, estimated from chemical analysis of samples of *Nicotiana suaveolens* from Western New South Wales that half a pound of the plant was sufficient to kill a sheep, and experimental feeding tests carried out by Drs. Seddon and McGrath, of the Glenfield Veterinary Research Station, confirmed this. We have, however, repeatedly received reports from Western Queensland that graziers have noticed sheep eating this plant to a limited extent without any ill effects following, and previous feeding tests had given negative results. This is probably explained by the fact that although Seddon and McGrath found that 12 oz. of the dried leaf of the plant were repeatedly poisonous to sheep, repeated small doses (of less than 12 oz.) were not toxic. The plant is very distatsteful to stock and, generally speaking, they don't eat the plant in quantities sufficient to cause trouble, although now and again losses from it are recorded. The poisonous principle is the alkaloid nicotine, and the chief symptoms are inco-ordination of movement and ocular disturbance. We should say it would be dangerous to feed the wild tobacco in the form of ensilage.

Creeping Knapweed.

INQUIRER (Pittsworth)—

Creeping Knapweed (*Centaurea repens*) may become a very serious weed pest, and should be treated immediately as a pest when it first makes its appearance in any locality. Frequent cutting off close to the ground with a strong scythe, so as to starve the underground runners by depriving them of the food from the green leaves is probably the best method of eradication. A flamethrower could be employed with equal success, but flame-throwing, cutting, or even poisoning would probably have to be done several times before the weed is eradicated and the underground runners finally starved out.

Mint Weed.

J.H. (Tara)—

The specimen represents the common mint weed (*Salvia reflexa*), a native of South-West United States, now a very serious pest in parts of Queensland. It is poisonous to stock, but most of the trouble in Queensland has been among travelling stock—ordinary paddock or resting stock apparently not being affected, or only to a limited extent. The poisonous principle is not known. If you only have a small patch of it, of course, eradication is immediately recommended.

Grasses and Fodder Plants.

J.L. (Dalby)—

There is no general book dealing with the grasses and pasture plants of Queensland. A book you would find very helpful is "The Grasses and Fodder Plants of New South Wales," by Mr. E. Breakwell, obtainable from the Government Printer, Sydney, or through any bookseller, price 6s. 6d. It is a very useful work, and with very few exceptions the grasses described and figured are either found growing naturally in Queensland or cultivated.

We will always be pleased to name and report on any specimens you can send. Of grasses, a shoot bearing seed-heads, doubled back and fore so as to fit comfortably in a sheet of newspaper is sufficient, but a few additional seed-heads included in the packet are always acceptable. Of weeds, shrubs, &c., a shoot a few inches long, bearing leaves and, if possible, either flowers or fruits, should be sent. When more than one specimen is sent, number each and retain a duplicate, when names corresponding to numbers will be returned.

Brush or Scrub Box.

H.T. (The Leap, via Mackay)—

The specimen represents the brush box or scrub box (*Tristania conferta*), a tree widely distributed through the coastal parts of Queensland and Northern New South Wales. Although called brush box or scrub box, it is frequently a native of open eucalyptus forest. The tree is grown extensively about Sydney as a shade tree, and is pruned to a very shapely tree. It is frequently grown and sold under the name of *Lophostemon australe*, but the name *Tristania conferta* has priority, and is the correct one to use. Writing of this timber, E. H. F. Swain in "The Timbers and Forest Products of Queensland" says:—"The special qualities of brush box, however, result in special applications. It is regarded as the best Australian hardwood for bridge and wharf decking, for wooden tram-rails, mauls and mallets. It is specified also for naves of wheels, wedges, and even golf-heads. It is liked in dockyards for large wedges, because it floats. Natural bends of brush box are used in shipbuilding as knees. It makes good bullock yokes, although the bow-holes are inclined to wear. In New South Wales it is used largely in general building, principally for studding and plates, but also for flooring and weather-boards. It becomes very hard with age. It may be classified as a good second-class general building hardwood, or an excellent timber for bush carpentry. Toughness, non-splitting, non-checking, non-wearing, and nonslipping surfaces are the special advantages which brush box offers in wood use. It is also abundant and cheap. It is difficult to season, and is liable to shrink, warp, and twist in small sizes."

A Close Relation of the Darling Pea (*Swainsona luteola*).

M.F.S. (Clermont)—

The specimen is *Swainsona luteola*, a plant very closely allied to the Darling pea. It is very common in parts of Queensland and New South Wales, and has caused considerable trouble amongst stock, particularly horses, in Central Queensland. As you say, horses do not recover from this plant, even when taken off the pea country. No poisonous principle from either this plant or the Darling pea has been isolated. No antidote, we believe, is known. Some years ago exhaustive work on the Darling pea was done by Sir Charles Martin, and his experiments showed that the nature of the symptoms indicated a disordered condition of some part of the brain, spinal cord or peripheral nerves. If animals are returned to proper feeding after a month or six weeks on the pea and before the symptoms are evident, they should recover completely; but when once the paralitic symptoms are shown they will not recover, but if returned to proper feeding will remain in much the same condition, becoming neither better nor worse. Although no antidote or direct remedy for the disease is known, pastoralists can take advantage of the fact brought out in Sir Charles Martin's experiments that it takes about a month to produce definite symptoms by feeding upon the pea, and so arrange that animals shall not remain in a pea-infested paddock for a longer period than four to six weeks at one time.

The Smaller Grass Tree—Is it Poisonous to Stock?

R.S. McI. (Rockhampton)—

There has always been an opinion among stock owners that the smaller grass tree (*Xanthorrhoea hastilis*) on the wallum country in Central Queensland is poisonous to stock. It is also an opinion that the larger growing tree in the ordinary forest is quite harmless. In fact, some graziers regard it as quite good fodder. Feeding tests were carried out some years ago at Yeerongpilly, but only with the ordinary forest kind taken from rather poor country. These yielded negative results. That experience seems to indicate that the trouble is a deficiency one, although, of course, it does not exclude the possibility of the grass tree being accessory.

Dr. J. B. Cleland, in the "Agricultural Gazette" of New South Wales for June, 1914, has notes on "Experimental Feeding with some Alleged Poison Plants of New South Wales," and under *Xanthorrhoea* he mentions:—"Cattle at Karuah said to become crampy. The cattle swell in the legs, fall off in condition, and continue unthriftly, even some of them dying. If removed to good, sound country, they do well." ("Agricultural Gazette," New South Wales, 1899, p. 859). In reference to this statement, Mr. Pottie, then Lecturer in Veterinary Science at the Hawkesbury Agricultural College, is reported as saying that conditions identical with those described are produced in cattle which eat the young shoots of the grass-tree after rain. He states that the shoots contain a resin, and the effects upon the animal's system are loss of appetite, condition, energy, and vitality, followed by weakening of the hind quarters, which eventually become paralysed, the animal dying of exhaustion and exposure.

Maiden ("Agricultural Gazette," New South Wales, Vol. 8, Part I., January, 1897, p. 22) quotes J. S. Allen as saying that the settlers in the vicinity of Jervis Bay had informed him that the shoots of the grass-tree, which when in blossom and eaten by cattle, give them a complaint called "cripples." It appears to affect their joints, and doubles them up.

Experiment at Milson Island.—A calf was fed from 5th November, 1912, until 2nd May, 1913. It was given from 1 lb. up to 32 oz. almost daily for this period. During part of the time, at the beginning of the experiment, the young shoots were taken from flowering plants, and portion of the flowering stem was also used. Later, when the flowering was over, just the young leaves were cut up and given. The animal was also given lucerne hay in the morning, the grass-tree being cut up and mixed with chaff in the evening. The animal ate the grass-tree well. No ill-effects were noticed at any time.

Comment.—This experiment does not support the view that the condition referred to was due to the eating of grass-tree leaves. It does not quite exclude the possibility in the special circumstances mentioned by the recorders, namely, young shoots in plants which are flowering, and young shoots after rain. It seems, however, hardly worth while to repeat experiments of this nature. "It is probable that cattle only eat the leaves when there is a scarcity of other more natural fodder, and the symptoms are perhaps explained on the fact that all necessary sustenance is not contained in the food they have access to under these circumstances."

The matter seems to be worth following up, as we should think it would be worth while securing young leaves and flowering branches from the wallum country and from forest country and making feeding tests or analyses to see if there is any difference in nutrition value.

Buttercup Bush.

W.S.C. (Roma)—

The specimen represents *Cassia australis*. Buttercup bush is a name applied to several species of cassia in the scrubs of the Maranoa and Western Darling Downs. Your particular species is very widely distributed, and mostly grows as a large shrub. We have not often seen it attaining tree size. We have no information on the quality of the plant as a fodder, but probably if eaten in any quantity it would cause slight purging, as the genus contains several species, which produce the senna leaves of commerce.

Pigeon Grass.

CORRESPONDENT (Reid's Creek, Gayndah)—

In the course of the month we received a letter from Reid's Creek, addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane, unsigned, and containing a specimen of grass for identification. It was postmarked "Gayndah, 2nd November, 1935."

The specimen is pigeon grass (*Setaria glauca*), widely spread over the warm temperate regions of the world, and closely allied to the millets grown in Australia under the name of panicum, Hungarian millet, &c. The grass is quite a good fodder, but mostly grows as a weed of cultivation, although it is not a serious pest. The correspondent also asked about Toowoomba canary seed. If he writes to the Director of Agriculture, giving his name and address, the information will be supplied to him. It grows best in the autumn and winter months.

Downs Grasses Identified.

Secretary of SUMMER GRASSES AND FODDERS CLUB (Groomsville, via Pechey)—

A. *Poa caespitosa*—Tussock grass; common in Southern Queensland on mountain slopes and similar elevated situations; usually regarded as an inferior grass.

B. *Koeleria phleoides.*—A small grass found in the Southern States and the colder parts of Queensland; of no particular consequence as a fodder.

C. *Microlaena stipoides.*—Meadow Rice grass; a small slender grass, very common in shady situations.

D. *Danthonia sp.*—A species of Wallaby grass; most of the wallaby grasses are very good fodders.

E. *Sporobolus elongatus.*—Rat's tail grass; an inferior grass common in Eastern Australia; usually rejected by stock.

F. *Bothriochloa decipiens.*—Bitter or Pitted Blue grass; an inferior grass very common in Eastern Australia. In the Southern States it has caused much concern, since it invades pastures, thereby considerably reducing their carrying capacity. It has been found that top-dressing with superphosphate encourages the growth of better-class grasses, which are then able to crowd out this species.

G. *Fimbristylis diphylla.*—Not a true grass, but a sedge. Nothing is known of its fodder value.

H. *Eremochloa bimaculata.*—Poverty grass; a grass usually rejected by stock.

I. *Cenchrus australis.*—Burr grass; common in Queensland, frequently as a weed of cultivation, along roadsides, &c. The burrs cling tenaciously to wool, hair, clothing, &c. Stock seem to eat the plant. Insects may frequently be seen trapped in the burrs, but they provide no nourishment for the plant.

A Rye Grass Relation. Hedge Mustard. "Saucy Jack."

V.C. (Gympie)—

(1.) *Lolium temulentum* Drake or Darnel; a grass closely allied to the rye grasses. The seed or grain is generally regarded as poisonous, the grass only being safe for feeding in the seeding stage. The grass is a common weed of cultivation in Europe and America, and a good deal has been written around it. Although we have noticed it here frequently, both on the coast and on the Downs, we cannot recall to mind any trouble being given by it.

(2.) *Sisymbrium officinale*, hedge mustard, one of the weeds frequently known in Queensland as mustard weed. It is not usually eaten by stock, although it is a common weed of cultivation. When eaten, like other weeds of this type, it taints milk rather badly.

(3.) *Centaurea melitensis*, a cockspur thistle or "Saucy Jack," a very common weed in the Southern States. In Queensland, it is most abundant on the Darling Downs. It is not poisonous to stock, but is only eaten in the young stages.

General Notes.

Staff Changes and Appointments.

Mr. A. C. Murray, of Coorparoo, has been appointed Inspector under the Dairy Produce Acts, Diseases in Stock Acts, and the Slaughtering Act, Department of Agriculture and Stock.

Mr. G. H. Sigley, Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock, has been transferred to Biggenden as Inspector under the Dairy Produce Acts, the Diseases in Stock Acts, and the Slaughtering Act.

Mr. J. Cattanach, Inspector under the Dairy Produce Acts, the Diseases in Stock Acts, and the Slaughtering Act, Department of Agriculture and Stock, has been transferred from Esk to Beaudesert.

Constable T. A. Smith, Rathdowney, has been appointed also an Inspector under the Slaughtering Act.

Mr. J. Eigenhuis has been appointed Consulting Mill Engineer, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

Mr. Norman Smith, B.Sc., M. App. Sc., Plane Creek Central Mill Co., Sarina, has been appointed Assistant Mill Technologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

Mr. R. E. Churchward, B.V. Sc., H.D.A., has been appointed a veterinary surgeon, Department of Agriculture and Stock.

Mr. J. H. Smith, Entomologist, at present attached to Atherton, will be transferred to Nambour.

Mr. G. W. J. Agnew, Inspector under the Diseases in Plants Acts, will be transferred from Nambour to the Bureau of Tropical Agriculture, South Johnstone, where he will perform work as Pomologist. Mr. P. Mitchell, Agent under the Banana Industry Protection Act, has been appointed also Inspector under the Diseases in Plants Acts, and will be attached to Nambour.

Mr. K. D. Hoffmann has been appointed Inspector under the Diseases in Plants Acts and Agent under the Banana Industry Protection Act, and will be stationed in the Granite Belt.

Messrs. E. S. Keehn and W. E. Hamley have been appointed Acting Inspectors under the Diseases in Plants Acts, the latter also an Agent under the Banana Industry Protection Act, and to be stationed at Burleigh.

Mr. C. Schindler, Inspector under the Diseases in Plants Act at present attached to Tallebudgera, will be attached to Warwick.

Constable H. Devantier, Nudgee, has been appointed also an inspector under the Slaughtering Act.

Mr. R. A. Blake, Tamaree, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Foreshores of Hervey Bay a Sanctuary.

An Order in Council has been issued in pursuance of the provisions of the Animals and Birds Acts declaring the foreshores of Hervey Bay (Urangan, Torquay, Scarness, Pialba, and Point Vernon) to be a sanctuary for the protection of native animals and birds.

Police as Stock Inspectors.

A regulation has been issued in pursuance of the provisions of the Diseases in Stock Acts, authorising police officers to inspect travelling stock under or in pursuance of Section 19 (2) of such Acts.

Rural Topics.

Stock Grazing—Capacity of Lucerne.

With a view to ascertaining the carrying capacity of a 55-acre lucerne paddock at the Cowra (New South Wales) Experiment Farm, particulars of its stocking have been recorded annually, by the experimentalist (Mr. Pearson).

The paddock, which was sown to lucerne in August, 1930, with 4 lb. of seed and 56 lb. of superphosphate, was situated on a hillside and comprised from good to inferior wheat land. Since 1932 it has been spring-toothed and top-dressed each year. It was found that during the twelve months ending 30th September, 1935, slightly under two sheep to the acre had been fed on the area.

During the year 1931-32 the average carrying capacity was 3½ sheep to the acre, while in addition 40 tons of hay were cut. Since then the carrying capacity has been approximately two sheep to the acre. The experimentalist pointed out that although these figures were not particularly high, the value was higher when resolved into monthly records. These showed that the lucerne provided the first green feed after a dry spell, and furnished a bulk of grazing over the difficult period in the early summer, and also supplied succulent fodder in April, May, and June, when the ewes were lambing.

Origin of Side-saddle.

Replying to a Brisbane correspondent, "The Australasian" quotes this interesting note in a London publication of 1892:—

"In a book entitled 'Remains Concerning Britain,' published in 1614, it is stated that Queen Anne, wife of Richard II., taught English women to ride on side-saddles, when, heretofore, they rode astride. As late as 1772, Queen Mariana Victoria, of Portugal always rode astride. There has been some discussion as to whether this ancient practice should not be revived and the side-saddle abandoned.

"In May, 1890, a lady, wife of an English baronet, appeared in the Row, attended by her groom, and mounted cross-legged. Her riding-habit was not only somewhat longer than the new fashion enjoins, but longer than the old one as well, and was simply a very voluminous divided skirt. The fashion [of riding astride], however, does not appear as yet to make much way in this country, although a well-known saddler some time ago wrote to the 'Field,' 'That it was not so uncommon for ladies to ride cross-saddle as might be supposed.'

"A curious side-saddle is used by women in Iceland. It has a seat with a back like a common chair, and has, instead of a stirrup, a little shelf on which both the feet can rest."

Points in Flock Management.

During the hot weather the flock should be handled as little as possible. The sheep should be in paddocks where there is good shade and water, and a supply of salt should always be available. Any work necessary with them should be done during the cooler parts of the day, and if water is available it should be sprinkled on the yards to keep them as free from dust as possible.

Any badly fly-struck sheep should be kept by themselves in a "hospital" paddock, where they can be given special attention and will not constitute a menace to the others, a fly-struck sheep always being attractive to flies. Such a paddock may be used for any sheep that are ailing, animals badly affected with grass seed, either in the eyes or generally, coming within this category.

Where mating is still in progress it will be found of advantage to shear the belly, and even the lower sides and under the neck, of rams on country where grass seed is prevalent.

It is at this time of the year that the value of shade trees in the sheep paddock becomes evident. There is no question that during the hot weather sheep will, if possible, spend the bulk of the day under the trees, doing their feeding in the early morning or evening. Admitting the claims of pasture and crop, far too little allowance is made for shelter on the average property.

Is the Crow a Pest?

The question as to whether the redeeming qualities of the crow outweigh its reputed sins has been raised more than once in recent years. The subjoined correspondence, taken from the "Sydney Morning Herald," is illustrative of the wide difference of opinion that exists:—

Mr. A. F. Basset Hull writes—

"I have read with much interest Mr. Willmott's questionnaire appearing in your issue of the 7th instant, and I freely admit that I have not seen all the dreadful things done by the crow as set out by Mr. Willmott. I am, however, aware of the general feeding habits of both the crow and raven from personal observation. My letter appearing in your issue of 22nd August last, and to which Mr. Willmott refers, was written merely as an officer of the Royal Zoological Society of New South Wales, the originator of the request that some measure of protection should be afforded to both crows and hawks where it can be shown that they are doing more good than harm in any particular locality. My society has for many years urged the necessity for careful collection of data before absolutely condemning any so-called pest, on the general grounds that there is always some good, even in the worst of creatures. To strike a balance and act accordingly is our aim.

"To show that even pastoralists of life-long experience differ in their views as to the value of the crow and eagle, I quote from a letter received by me from Sir Frederick McMaster under date 22nd August last: 'I would like to take this opportunity to congratulate you and heartily endorse your article in this morning's "Herald" on the protection of bird life. From a life-long experience as a pastoralist, very early in my career I formed the definite opinion that man was building up a heap of trouble for himself in the wholesale destruction of bird life. I am the first station in my district to lamb, and, consequently, attract hawks and crows from near and far. But, valuable as my lambs are, I have decided that it is better in the common interest to let the birds take their share of them, than in any way to contribute to the upsetting of "the balance of Nature." For years, as a member of the Merriwa P.P. Board, I was instrumental in preventing a bonus on hawks and crows, but, unfortunately, such a condition is the exception in this great country. If any of my remarks or experiences will help you to maintain the fight for the protection of bird life, I shall be very glad if you will use them.'

"I have other letters in the same vein from pastoralists in the Cooma, Quirindi, and other districts. Surely there is need for a full investigation when so many and such expert witnesses agree to disagree. As far back as November, 1918, Mr. W. W. Froggatt, then Government Entomologist, published in the 'Australian Zoologist,' the journal of my society, a lengthy summary of the question as regards the crow, quoting the opinions of many then prominent pastoralists pro and con, and summing up decidedly in favour of affording at least partial protection to this much-abused bird."

Mr. W. R. Murray, of Green Grove, Manildra, writes—

"Of late I have noticed in the 'Herald' several letters for and against the protection of the crow, one being from Mr. Wilfred Wilmott. He certainly gives a lot of the crow's faults, which are perfectly true. But so far none of the writers have mentioned one of the cursed crow's worst faults; that is, the destruction of both eggs and young of our most valauble insect eaters, all the small birds that abound in the inland districts. These small birds are invaluable to both farmer and grazier.

"Of these the crow takes a terrible toll; in fact, he has in some districts almost wiped out some of our most valuable birds—the little peewee for one. These birds always build near the water, mostly in the water-gums along rivers and creeks. Of these the crow takes fully 25 per cent. of both eggs and young; besides tens of thousands of eggs and young of all other of our insect-eating birds.

"I can endorse every word of what Mr. Willmott has written. Like him, I have had over sixty years' experience in bush life amongst both stock and crops; and I can say that the crow is the worst enemy that the man on the land has to contend with. The fox and the dingo we can beat; the rabbit we can control; but the crow—never. He, like the poor, will always be with us. I consider as a pest he stands right out on his own."

Valorous Youth.

Each year when the awards of the Royal Humane Society are announced the number of boys and girls who have displayed courage, resource, and self-sacrifice is notable. Valour is not confined to either sex, nor to any age, for in this year's list there are several women and girls and men and boys of all ages. The youngest is a little fellow from Kyneton, who receives a certificate of merit. He is Albert John Ashby, aged eight years, who rescued his little sister, aged seven, from drowning in the Campaspe River. "Oh, I wish I could swim," was his first cry as he saw his sister fall off a plank bridge, but that did not deter him, for he plunged in, and with resource remarkable in one so young, told another sister to run for help, while he seized the one in distress by one hand and hung on to a willow branch with the other. He had finished his rescue work by the time help arrived.

Thelma May Jones, a little girl, aged 10 years, has been awarded a bronze medal for a very courageous act. Several children were playing near a fire in the bush when her baby sister aged three years went too near the fire, and her clothing was soon alight. Thelma, the eldest of the party, went to the rescue. With her bare hands she tore the clothing off her little sister, and taking the baby in her arms pressed her to her bosom. She was severely burned herself, and had to be taken to hospital. Her efforts were unavailing for her little sister succumbed, but she had great satisfaction in knowing that she did all that was possible. Phyllis Mary Shoebridge, of Bulimba, Queensland, was sitting on the beach at Sandgate, when she heard cries of distress, and looking out to sea saw two children in difficulties. With quick decision and prompt action she plunged in and saved them both.

Two boys, Mervyn Read, aged 16 years, and his brother, Ray, aged 15 years, came from Robinvale to receive certificates of merit for saving a man from drowning in the Murray. Mervyn went to his rescue first, but could not cope with the heavy burden, and the younger boy went to his assistance, and between them they effected the rescue.

The eyes of youth shine brightly when these deeds of valour are performed. As each year the recital of these rescues is made one is impressed by two facts; first, the courage and unselfishness which prompt them; second, the urgent necessity for every boy and girl to be taught to swim.—R. W. WILMOT, in "The Australasian."

Maryborough Dairy Association—Butter Output.

To have increased within the present century its output of butter from 15 tons to 6,529 tons per annum, and its payments to cream suppliers from £1,388 in 1901 to £586,484 in the year ended June 30th last is the wonderful record of progress of the Maryborough Co-operative Dairy Association as revealed by the balance-sheet and reports presented at the association's thirty-sixth annual meeting of shareholders at Wondai.

Of the association's five factories—Maryborough, Kingaroy, Biggenden, Mundubbera, and Wondai—the output of the last named is second only to that of Kingaroy factory, and, since its establishment in 1932 has manufactured 5,376 tons of butter (an average of 1,344 tons per annum) and has paid to suppliers £472,621, whilst the quality of the article turned out is proved by the winning of many of the best awards in world-wide competition.—"South Burnett Times."

Crossbred Lamb Breeding.

In an address to the Southern District (New South Wales) Agricultural Bureau Conference at Junee, Mr. B. J. Stocks, of Linden Hills, Cunningar, one of the most successful fat-lamb raisers in Cootamundra district, attributed the success of his production to the supply of adequate feed to the breeding ewes and the lambs at all times, supplementing the supply with chaff and oats before it became necessary. During the last two seasons, using Southdown rams mated with first-cross Border Leicester or Romney Marsh ewes, he had trucked 110 per cent. of lambs from 1,005 ewes, and 122 per cent. from 1,150 ewes respectively.

Relying mainly on lucerne supplemented with paddocks of subterranean clover and Wimmera rye he had found the best arrangement was to make both lucerne and grass paddocks always available to the sheep by leaving the gate open between the paddocks. During the winter months he had found that a supplementary ration of 1 lb. to 2 lb. of green wheaten chaff, with a sprinkling of bran added, fed in troughs each day, was of great value in giving the sheep resistance to disease and parasite infestation, and was well worth the extra expense and trouble. The secret of success in fat-lamb breeding was to never allow the lambs to suffer a check, and, with a plentiful supply of well-balanced fodder, made possible by top-dressed pastures and lucerne, the road to successful fat-lamb breeding was sure.

Feats of Horsemanship.

In the "Questions and Answers" column of "The Australasian" for 12th October, "Record" (Hillston, New South Wales) recalls that "Big" Bowden, of Penola (South Australia), frequently rode 80 miles one day and home the next. "Rider and gear" weighed 21 stone. Mr. Bowden had property at Portland (Victoria). Members of his family believe him to have been the first white child born in Tasmania. His father, who was with Collins's expedition as surgeon, is mentioned in the diary of the Rev. R. Knopwood.

The correspondent encloses cuttings of articles on similar achievements from the "Sydney Mail" of July 31, 1929 (signed "Yarri"), and from the "Land" of January 13, 1934 (signed "Murrungurry"). Among the feats recorded are these:—

A one-time commissioner of police in Adelaide, Alexander Tolmer, rode from a police camp to the city, 120 miles, in one day, on a horse called Buckshot.

A lad, afterwards widely known as Cockatoo Jack, was sent from Rosebrook to Cooma (New South Wales) for the doctor. As the doctor was out the boy rode on to Queanbeyan, 79 miles from Rosebrook. There he found a doctor, and at once started back with him. The doctor's town hack knocked up. He mounted Jack's grass-fed stock-horse, which carried him to Rosebrook and completed the full journey of 158 miles in 27 hours.

When the Montebello was wrecked at Kangaroo Island in 1906 a selector's son carried the news to Kingscote, 79 miles away, inside nine hours, on a 13-hands pony. The same pony carried a man weighing 11 stone 97 miles between sunrise and sunset.

A Queensland squatter, A. E. Hanslow, in January, 1898, rode a four-year-old mare from Mount Morris to Boothalla and back, 124 miles, in 14 hours.

Another Queenslander—a drover, Charlie Turner—having to inspect cattle at various places on specified dates, rode from Leigh's Creek (South Australia) to Winton (Queensland), 800 miles, in 14 days, with three changes of horses.

A prospector, Dave Collins, aged 80 years, rode from Clare (South Australia) through the Northern Territory and into Western Australia, covering 7,816 miles. The time taken on the journey is not known.

A policeman rode out from the Darling to inquire about two swagmen who had died of thirst on a far western track and to bury them. He left a homestead on the river at 10 o'clock on a summer night, and was back at 9 o'clock on the following night, covering 136 miles.

A boy aged 12 years, Archie Danvers, of Wellington (New South Wales), was trailing horses that were making back to their native run, somewhere near Tumut. He left Wellington on a Monday, and overtook the horses at Gundagai on the following Friday. He was mounted on a pony, and in the five days he rode 300 miles.

In 1857 Sylvester Fraser was the only survivor of the massacre at Hornet Bank, on the Dawson River. His brother, Billy Fraser, was in Ipswich with the station teams. To tell him of the tragedy the boy rode from Hornet Bank to the town, 320 miles, in three days, with two changes of horses. The return journey was accomplished in the same time, with three changes of horses—640 miles in six days. Sylvester Fraser's age was 14 years.

In the Northern Territory in 1919 Mat O'Connor, about 60 years of age, became blind. He set out for the railhead at Katherine, 350 miles away, over difficult country, and the distance was covered in 11 days. A mate led his horse, while the blind man led their packhorse. From the railhead he journeyed to Darwin, thence to Sydney.

In 1910 two daughters of Sir Sydney Kidman rode from Kapunda (South Australia) to Cunnamulla, on the Warrego, more than 1,000 miles, and much of it over trackless country. On some days they covered 60 miles. Their father journeyed with them in a waggonette containing food and baggage, and there was a black guide.

In 1885 Frank Howson, a wool-scouring contractor, rode an eight-year-old grey mare from Booligal (New South Wales) to Killera Station in one day and back the next, 221 miles. On the two following days he rode the mare 100 miles more. This mare was fond of beer, and she was given some of it on the road whenever the rider had a drink.

In September, 1860, one Skillicorn made a wager of £150 with a Bathurst hotelkeeper, Job Manning, that he would ride from Bathurst to Sydney, 125 miles, in less than 20 hours. On bad roads he did the journey in 19 hours 50 minutes, but he lost the wager because he had walked about 100 yards with a man who had asked him to have a drink. It was said that the man had been stationed at a wayside inn to cause the conditions to be broken; it had been stipulated that Skillicorn was to ride all the way.

Following are additional extracts from recent issues of "The Australasian":—

R. (Melbourne) sends an extract from a recent number of the English journal "Horse and Hound":—

In these days of marvellous speed records achieved by mechanical locomotion it is interesting to read of a record ride on horseback, set up in 1745, and of the widespread interest it caused. To quote from a print contemporary with the ride:—"Mr. Cowper Thornhill, keeper of the Bell Inn at Stilton, in Huntingdonshire, set out from his house at Stilton at 4 in the morning, came to the Queen Arms against Shoreditch Church in 3 hours and 52 minutes, returned to Stilton again in 4 hours and 12 minutes, came back to London again in 4 hours and 13 minutes, for a wager of 500 guineas.

"He was allowed 15 hours to perform it in, which is 213 miles, and he did it in 12 hours and 17 minutes. It is reckoned the greatest performance of the kind ever yet known. Several thousand pounds were laid upon the affair, and the roads for many miles were lined with people to see him pass and repass."

The average rate required to win the wager was a little more than 14 miles per hour, but the rider averaged over 17. It is not stated how many horses were used for the ride, which is more remarkable for the endurance of the rider than for the speed of his mounts; but to maintain on horseback an average of 17 miles per hour for over 12 hours is no mean feat for a horseman.

Mr. H. M. Warburton, inspector of stock, Nyngan (New South Wales) writes:—

Mr. Alfred Lodge, of Bonnington, Warren, who owns a station property, Hornseywood, rode a well-fed horse from Warren to Hornseywood, a distance of 80 miles, in 14 hours. He gave the horse 2 hours' spell at dinner-time, and three half-hour spells during the trip.

Mr. Lodge was 77 years of age last March. Both horse and rider were O.K. on arrival at the destination. This is a wonderful endurance test for a man of Mr. Lodge's age, and would take a lot of beating.

Feeding—The Cow that Fills the Bucket.

"Any good cow will give a lot of milk just after calving—Nature sees to that—but it is what she averages after six months that counts in a 273 days' test," pointed out Mr. G. F. Shirley, in an address at the recent western district conference of the New South Wales Agricultural Bureau.

"Only a good cow will stand that strain, and you can hardly expect an animal that has been deprived of some of the essentials of life in her early youth to be able to stand the racket of high production later on. Dairying is one of those industries where a 'long-distance' view must be taken when laying the foundations for future performances. I have found that many breeders do not fully realise that it is just as important to 'build them right' as to 'breed them right.' You can over-feed, yet stunt, the best bred poddy in such a way that she will never be a producer, whilst surprising results can be obtained from moderately good animals by judicious feeding."

Manure-sack Filler.

It is a great convenience to have both hands free when filling manure sacks after mixing. The following is useful and as satisfactory as anything which can be used. Take an out-of-commission milk can (ordinary one) and cut out the bottom; draw the bag to be filled over the top end until it just comes over the handles. Then invert the can and attached bag and fill. When full grasp the handles of the can, with bag over them, and lift up, when the sack will be filled easily and quickly. If you weigh the contents of one filling you will know almost exactly what each bag holds, which will be found of great assistance when regulating the quantities through the top-dresser or drill.—"The Canegrowers' Weekly" (Mackay).

Pasture Management.

The falling off in the lambing percentages in a number of districts in New South Wales is a problem that is to-day engaging the attention of scientists. On a number of stations on the northern tablelands the lamb-marking this season will not average 50 per cent.

Referring to the problem, Colonel H. F. White, of Bald Blair, stated recently that he believed this to be another phase of the mismanagement of pastures. The pastures, he said, were not standing up to the demands made upon them. Up to the present, nature had been milked through the pastures, from which 60 per cent. of the national wealthh of the country emanated, without anything having been put back to replace the wastage. He believed that the day was fast coming when pasture improvement would become compulsory.

Depleted pastures were responsible for weed growth, and to an extent soil, he said. Wherever you look you will see where weeds have taken possession of places that have been eaten out. England had been grazing on the same pastures for hundreds of years, and they were as sound as ever because of a definite system of pasture improvement. This excellent example had also been followed extensively in New Zealand and Argentina.

Nor was it as widely recognised as it should be that the rays of the sun were the best and cheapest fertilising agent known. The more the grazier and farmer tickled the soil the better were the pastures and crops. By means of the chain harrow the crust of the soils hhould be broken after rain, thereby permitting the sun's rays to enter the soil, and at the same time forming a surface mulch that conserved the moisture.

Nine Good Reasons for Milk Recording.

There are nine convincing reasons given by the Louisiana State University for keeping records of dairy cows, which are universal in their application. They enable the dairyman to feed each cow according to the quantity of milk she produces. They form the only basis on which a herd can be improved. No careful dairyman will buy a herd bull whose dam has not got an authentic record showing creditable milk and butterfat production. Records alone will sell cows when no other quality will; grade cows with records can be sold for from 25 to 50 per cent. more than those without records. A system of records is the first step in building up a herd; the unprofitable cows are the most expensive; their heifer calves are usually low producers and should not be raised. Records stimulate better feeding and breeding; the dairyman who keeps records usually keeps a balanced ration and becomes interested in winter dairying, which has numerous advantages over breeding cows to freshen in the spring. The weighing of the feed and milk keeps the owner in close touch with the daily condition of each cow. Records stimulate better milking; milk scales serve as a check on the milker, and induce him to milk more thoroughly than when the milk is not weighed. A knowledge of what each individual animal is doing develops personal pride and interest in the herd. Finally, records make dairying a business proposition, and in various incidental ways mean more money to the man who milks.

Wild Bird Life.

In South Africa special provision has been made to protect wild bird life. The Wild Birds' Protection Act came into force recently. The Act provides that no person shall capture any wild bird (except under certain specified conditions), and no person shall sell, purchase, or barter any live wild birds unless such capture, sale, purchase, or barter is effected in accordance with a permit issued by the Minister for Agriculture and Forestry. Any person who conveys any live wild bird over a public road, or is in possession of any live wild bird on land whereof he is not the owner or occupier, will be deemed to have contravened the provisions of the Act. The penalties for contravention are heavy. The spread of insect pests in Africa has been attributed in part to the destruction of bird life. In Australia also there is room for more protection of wild birds. Queensland farmers are fully alive to the economic value of insect-eating birds, and the policy of the Department of Agriculture and Stock in proclaiming wild life sanctuaries in different parts of the State is becoming appreciated more widely every year.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE PRE-SCHOOL CHILD.

SO little is known of the work of our Baby Clinics, that we sometimes hear it said that there is an unfilled gap between their activities and those of the School Medical Service. There is absolutely no foundation for these statements. Our service extends to all children up to school age. Our earliest and most urgent work was concerned with the first year of life, is now well established, and has given great results. Not that it is yet complete; many districts in this State still remain without our services and there are still mothers within easy reach of our clinics who fail to make use of them. Even those who cannot possibly reach our clinics might obtain help by writing to the nearest clinic. But our chief anxiety for some years past has been over those who have passed their first year, for there are so many distressing cases of badly fed, ill-nourished children, whose mothers have not yet realised that toddlers require as much knowledge and skill in the building up of strong and healthy bodies as do young babies.

Of course, toddlers require many things that we cannot supply. Kindergartens, nursery schools, playgrounds, and above all wise mothers it is beyond our power to supply; but for the development of the toddler's mind and character a sound healthy body is the basal requirement, and to ensure this is our most earnest endeavour.

THE NEW MOTHER'S BOOK.

The last remaining copies of this book are being fast exhausted, and we are preparing a new and revised edition, which will, we hope,

soon be printed. Science has been advancing during the last two years, and so has our knowledge of the actual present condition of our Queensland children. Consequently, the whole section dealing with nutrition has been revised and largely rewritten. The section on maternity has also been much enlarged and improved. In the remaining sections the alterations have been less extensive. This book is not intended to supersede the work of our nurses, but to assist it. A book can teach general principles to an intelligent reader; their application to the individual child is always a special problem, and needs personal attention.

THE FORCE OF EXAMPLE.

Some two years ago I entered the breakfast room of a small boarding-house in Tasmania. A young mother of a common type—healthy, good-looking, with little knowledge, but very pleased with herself—was trying to make her little girl of five eat her porridge, and not succeeding. The cause of the trouble was evident at a glance—the mother herself was eating fried sausages. I should have remained a silent spectator of this little drama, had not the mother at my entrance said to her child, "Here comes the doctor! You had better eat your porridge quickly, or he will give you a dose of castor oil." This I could not endure, so I said quietly, "No, I do not do that sort of thing. I can show you a better way of getting your child to eat her porridge than telling her to do so." The mother looked up surprised. "A little example would be much more effective." Just then my own breakfast was brought in. I turned to the little girl and said, "See what the doctor has for breakfast. I eat my porridge and milk because it is good for me, and because I like it!" The little girl turned to her plate and emptied it without a word. I narrate this little incident for the benefit of other mothers.

THE POWER OF SELF SUGGESTION.

The other day I was consulted by a young nurse-probationer, whose diet was unsatisfactory. She declared that milk always gave her indigestion. I did not doubt her word, but asked her if she could take junket. She could and did. Should I have told her that every drop of milk she drank turned into junket soon after being swallowed? Would this have cured her of milk-indigestion? More likely, I fear, she would have found that junket also did not agree with her. Such is the power of auto-suggestion!

I imagine that this young woman had had a mother who disliked milk, and allowed her child to see it. Or perhaps she tried to force her child to drink milk. Worse still, she may have done both. In this way food aversions are forced on to children to the grave detriment of their future health.

HEALTH AND MOTHERCRAFT TEACHING IN SCHOOLS.

We shall never be a really healthy people until we have health teaching in our schools, practical as well as theoretical. Children are keenly interested in health talks. We have proved this all over Queensland. But something more than talk is needed. The school lunch should be a practical demonstration of wholesome and attractive food; very different from what it is at present.

Mothercraft is a part of health, there is no distinction between them. Mothercraft and health are naturally taught together.

COMMON DANGERS ON REEF AND SHORE.*

A RECENT tragedy in the waters of North Queensland has demonstrated the dangers awaiting the unwary on sandy beaches or on the reefs along our sea shore. It is especially desirable that children and adults should be warned of these dangers, for with the coming of the warmer season and the holidays of Christmas and New Year the beaches and coastal waters will be thronged with many thousands of people to whom such a warning might come very opportunely.

The accompanying photographs depict objects which should be avoided. Advice for curing or relieving pain is given where possible.

THE PORTUGUESE MAN-OF-WAR.

PLATE 311.
The Portuguese Man-of-War.

Blue-tinted sausage-balloon often found in the water or on the beach near the edge. It has several long blue strands which may sting a person so severely that paralysis and even death may follow. The photograph shows the balloon (pn.), polyps (p), and stinging strands (t.).

Cure.—Apply sal volatile as quickly as possible to the affected parts. Sal volatile may be used also for jelly-fish stings.

* Reprinted from the "Education Office Gazette," through the courtesy of the Department of Public Instruction.

CONE SHELL (GEOGRAPHUS).

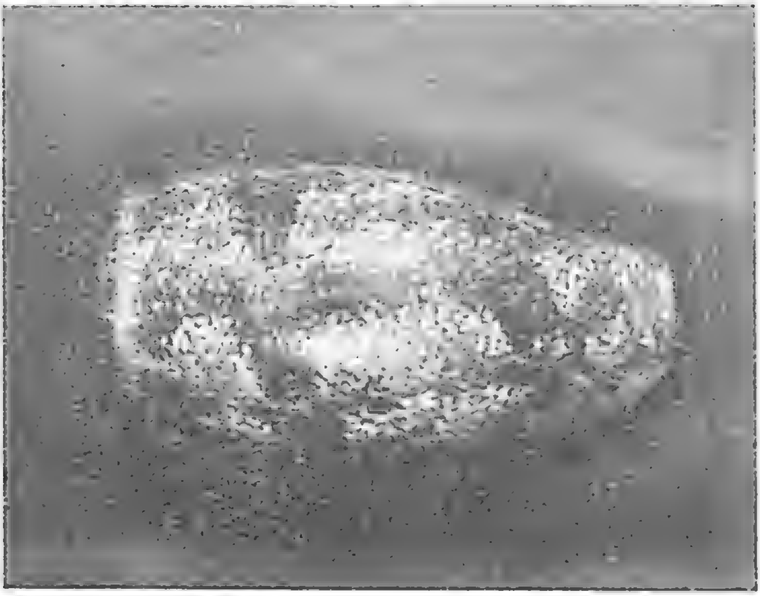


Plate 312.
Cone Shell (Geographus).

Usually found under large boulders. It is a pretty shell, which should *never* be handled except with tweezers. It was one of these shells that caused the death of a man a few months ago.

CONE SHELL (TEXTILE).

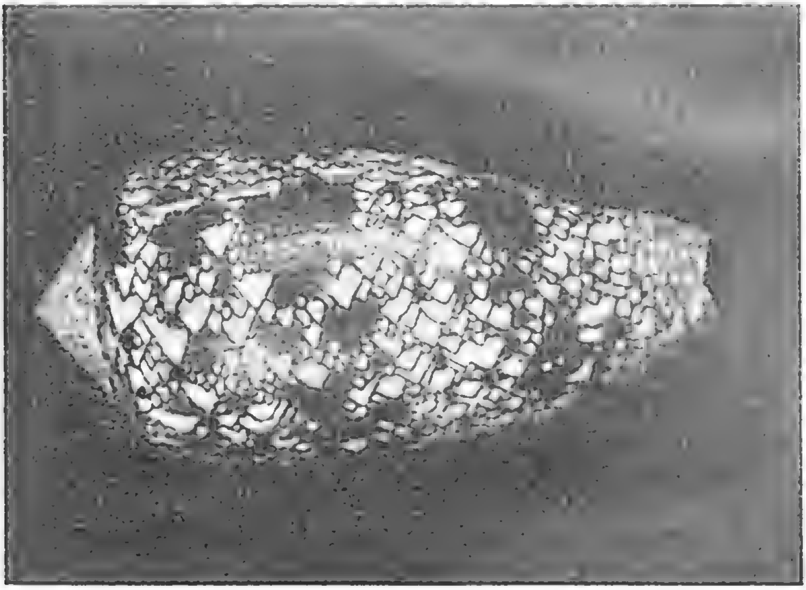


Plate 313.
Cone Shell (Textile).

This textile cone is the commoner of the two cones and is considered not quite so deadly.

STONEFISH.

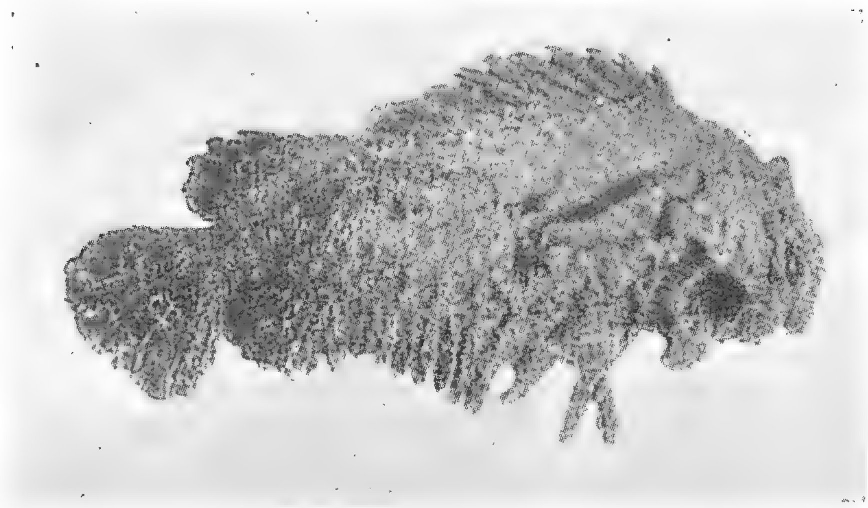


Plate 314.
Stonefish.

Sluggish in habit. When danger threatens it raises its thirteen dorsal spines. Usually hidden among weed and sand. Causes excruciating pain, relieved only by morphia, and lasting in effect for as long as six months. Sometimes found in Moreton Bay.

Cure.—Relief may be obtained by applying heated onion. Medical aid should be summoned immediately.

CUTSHELL (OR RAZOR SHELL).

Usually so embedded in the muddy sand as to have its sharp razor edges just level with the surface. If a wound has been inflicted by a razor shell (or an oyster), care should be taken to clean the wound of all pieces of shell and then cover with collodion, which will form a seal over the injured part.

GENERAL ADVICE.

Never go wading unless stout shoes with thick leather soles are worn; sandshoes are not a really suitable covering.

Never touch any strange object in the water or on the beach.

IN THE FARM KITCHEN.

ECONOMICAL AND WHOLESOME DISHES.

It is not necessary to have an elastic house-keeping allowance in order to provide tasty dishes. In fact, many a woman who is able to order anything she fancies fails to achieve distinction as a cook, while her next-door neighbour, who must count all of her pennies, serves attractive and wholesome fare to her family. In order to do this one must have a knowledge of the cheaper cuts of meat (which, incidentally, are often the most nourishing) and know how to serve them to the best advantage.

The cost of each dish made from the following recipes is approximately ninepence. This cost prohibits recipes made with expensive cuts of meat, and therefore ingenuity has to be used in substituting the less expensive materials instead of cutting out the many delicious dishes usually made with the more costly goods. These recipes are intended to help the busy housewife, and the many quick dishes and casserole dishes (which require very little attention) will be found invaluable.—E.P., in the "Sydney Morning Herald."

Skirt Steak and Savoury Potatoes.

Take ½ lb. skirt steak, ½ lb. potatoes, 1 large onion, small piece of butter, milk, pepper, salt.

Boil the potatoes in salted water with the onion. When cooked and drained put through a coarse sieve. Have ready in a saucepan a little milk, butter, and pepper. Have the liquid very hot, and add the potato mixture. Stir over the heat. Melt a little butter or dripping in a frying pan and brown each side of the steak. Make some gravy after the meat is done by adding a little water, pepper, salt, and a dash of any bottled sauce. Stir and cook for a few minutes. Put the potatoes round the edge of a flat casserole and rough up with a fork. Place the meat and gravy in the centre and put into the oven for about fifteen minutes to brown. Before serving spread a little butter over the steak, also a few drops of lemon juice, and sprinkle with chopped parsley.

Seaman's Pudding.

Take ½ lb. chuck steak, 1 large onion, ½ lb. flour, 2 oz. chopped suet, 1 teaspoonful baking powder, salt, pepper, a few outside stalks of celery.

Cut the steak into small pieces. Place them in a casserole (or pan) and cover with water. Add seasoning to taste, sliced onion, a little chopped parsley and chopped celery. Place the casserole in the oven and bring to the boil, skim well, and simmer for one hour (gently). Make some suet pastry with the flour, suet, baking powder, a litle salt, and a little water. Roll out, and place in the casserole on top of the cooked meat. Put on the lid and simmer gently for about forty minutes.

Steak Mignon.

Take ½ lb. chuck steak, a little salad oil, parsley, butter, salt, pepper, two small rounds of toast.

Cut the steak into two rounds and about an inch thick. Brush over with salad oil and grill. Have ready some green butter, made as follows:—Chop some parsley very fine and work into a little butter, with salt and pepper to taste. When the steak is cooked put a nut of the butter on to each round. Have ready two rounds of toast slightly larger than the steak. Place the steak on these and serve at once with chipped potatoes and gravy. Garnish with sprays of parsley or watercress.

Viennese Fried Veal.

Take ½ lb. fillet of veal, 1 hard boiled egg, 1 egg, 1 dozen capers, 3 anchovies, 1 lemon, breadcrumbs, dripping.

Cut the veal into thin slices, put it on a board and beat with a rolling-pin. Season with pepper and salt on both sides and brush over with beaten egg. Toss in breadcrumbs, and when evenly covered fry in a little dripping. Crush the hard-boiled egg with a fork and sprinkle in the middle of each slice of cooked meat. Put a few capers and a curl of anchovy in the centre of each piece. Serve with thin slices of lemon.

Ragout of Mutton.

Take 1 lb. neck mutton, 1 tablespoonful pearl barley, 1 oz. butter, 1 tablespoonful flour, 1 onion, 1 carrot, sprig of mint, piece celery.

Cut the mutton into neat pieces. Season the flour with salt and pepper, and dip in the meat. Melt the butter in a pan and fry the meat. Cut the vegetables into dice. Put the meat and vegetables in a casserole with the pearl barley. Add a pint of water and cook in the oven for about one and a-half hours.

Kidney Fritters.

Take 3 sheep's kidneys, ¼ lb. flour, 1 egg, 2 tablespoonfuls milk, salt, deep frying fat.

Boil the kidneys for a quarter of an hour. When cold cut in half lengthways. To make the batter put the flour into a basin with a pinch of salt. Mix the well-beaten egg with the milk and pour slowly into the flour, stirring all the time, until a smooth batter is formed. Dip the halves of kidney in the batter, and when well covered fry in the boiling fat until a golden brown.

Grilled Sausages and Cabbage.

Take ½ lb. beef sausages, 1 small cabbage, 1 onion, a little butter, seasoning.

Parboil the cabbage, after it has been well washed. Drain thoroughly. Melt the butter in a casserole and add chopped onion. Cut up the cabbage and cook for half an hour. Grill the sausages, putting these on top, and mix in a small piece of butter. Put on the lid, heat thoroughly in the oven, and serve with mashed potatoes.

Sausage Meat and Potato Cakes.

Take ½ lb. sausages (beef), 1 lb. potatoes, 2 oz. butter, ½ gill milk, flour, stock, seasoning, parsley.

Skin the sausages (this can be easily done by putting them in cold water for a minute or two) and shape into small rolls with flour. Cook in a little stock for twenty minutes. When cold cut into slices and cover each slice with potato that has been mashed with a little butter and milk and seasoned with pepper and salt. Put on a well-greased tin in a hot oven. Bake until brown, then turn so that both sides are brown.

Cannelon of Beef.

Take 1 lb. lean rib steak, 2 rashers bacon, 1 egg-yolk, a little nutmeg, grated lemon rind, pepper, salt, parsley, thyme, gravy.

Chop the meat very fine and pass the bacon through the mincer. Mix both together thoroughly, then mix the grated lemon rind with the parsley (chopped) and thyme. Add to these the grated nutmeg, pepper, and salt, to taste. Add all these ingredients to the chopped meat and mix well together with the egg-yolk. Form the mixture into a roll and wrap it round with a well-buttered paper. Bind round the paper with tape to keep it together and in shape. Put into a well-greased baking tin and bake in a moderate oven for about three-quarters of an hour. Place the roll on a dish and pour a rich brown gravy round it.

Breast of Lamb Stuffed and Baked.

Take ½ lb. breast of lamb, 3 oz. breadcrumbs, 1 oz. suet, 1 teaspoon mixed herbs, 1 dessertspoonful chopped parsley, salt, pepper, grated lemon rind, a little milk.

Remove the bones from the meat. Make a seasoning of the breadcrumbs, chopped suet, parsley, herbs, grated lemon rind, pepper, and salt, and bind all together with a little milk. Spread the seasoning down the middle of the meat and make into a roll. Tie this round securely, cover the outside with any odd bits of fat, and bake in a moderate oven with a piece of greaseproof paper over the top. Remove the paper ten minutes before serving. Serve with mint sauce.

ORANGES AND LEMONS.

Fruit Salad in Orange Cups.

Take three large oranges; 2 slices pineapple, diced; 12 marshmallows, quartered; one-third of a cup of chopped nuts; two-thirds of a cup of strawberries, halved; lettuce.

Cut oranges in two, remove pulp carefully, leaving shell clean. Mix pineapple, marshmallows, nuts, and strawberries with orange pulp. Fill orange cups, cover with cream mayonnaise, and garnish with nuts. Serve on lettuce.

Orange Cream Custard.

Take 2 eggs, ¼ cup of sugar, 2 teaspoons flour, ⅛ teaspoon salt, 2 cups milk, ½ teaspoon vanilla, 5 tablespoons sugar, 4 oranges.

Beat egg-yolks, add ¼ cup of sugar, flour and salt, and mix thoroughly. Add milk and cook in a double boiler until thick enough to coat spoon. Cool, add vanilla, and turn into serving dish containing peeled and sliced oranges. Beat egg-whites with 5 tablespoons sugar. Heap on top of custard and serve.

Orange Bavarian Cream.

Take 1 tablespoon granulated gelatine, ¼ cup of cold water, 1 cup orange juice and pulp, 1 tablespoon limejuice, ½ cup sugar, sprinkling salt, 1 cup cream.

Soak gelatine in cold water for five minutes and dissolve by standing cup containing mixture in hot water. Add to orange juice and pulp. Add limejuice, sugar, and salt. When it begins to jelly fold in whipped cream; turn into cold mould to become firm.

Orange Blancmange.

Take 4 oranges, 1¾ pints milk, 2½ oz. cornflour, 4 oz. caster sugar.

Grate the rinds of the oranges, then squeeze them. Strain and measure the juice. Mix the cornflour to a smooth paste with the orange juice. If there is not as

much as a quarter-pint of juice from the oranges, a little extra milk must be added after the juice has been mixed with the cornflour. Put the milk and sugar into a saucepan and heat them. Pour the hot milk on to the mixed cornflour, then return it all to the saucepan, bring to the boil, and boil for eight minutes, stirring all the time. Add a few drops of cochineal (sparingly), pour into a wet mould, and leave until set. Turn out carefully on to a dish and serve.

Orange Creams.

Take 3 dessertspoonfuls of caster sugar, 2 oranges, ¼ pint cream, 1 egg-white, ¼ oz. gelatine, ½ gill water, angelica.

Cut the oranges into halves and remove the pulp, without splitting the rinds. Take out the pips, rub the pulp through a fine sieve, and mix well with the caster sugar. Whip the cream until it thickens, and add half of it to the orange pulp. Whisk the egg-white and fold in lightly. Dissolve the gelatine in the water, but do not let it boil. When cool, strain it into the orange mixture, and mix all thoroughly together. Wipe the orange rinds, stand them on a plate, and fill each half with the orange cream. Leave until set, then decorate the top with the remainder of the cream and a few stalks of angelica. Stand on a lace paper, and serve in the orange cases.

Orange Pudding.

Take 4 sponge-cakes, 1 pint milk, 3 eggs, 1 orange, some orange marmalade, 3 dessertspoonfuls sugar.

Separate two of the eggs and beat the third whole egg and the two yolks together. Crumble the sponge-cakes finely, and add to the eggs, with the finely-grated orange rind and strained juice. Stir in the marmalade and sugar, and mix all together, then turn into a fireproof dish and gradually stir in the milk. Whisk the egg-whites to a stiff froth, and fold in lightly. Bake gently until set, being careful not to let it boil. Serve cold, decorated with a few quarters of orange.

Orange Salad.

Take 2 large oranges, 1 large ripe pear, a few glace cherries, a few almonds.

Cut the oranges in half, across the sections. Remove the pulp carefully, and cut the peel round the edges. Peel and quarter the pear and remove the core. Cut the fruit into pieces, then mix with the orange. Blanch and split the almonds. Cut the cherries in quarters. Arrange the pear and orange in the orange cups and decorate with almonds and cherries. Serve with cream. (Tinned pears may be used).

Mixed Orange Salad.

Take 2 oranges, 1 small pineapple, 2 oz. walnuts, 1 cream cheese, French dressing. Peel the oranges and pineapple and cut them into dice. Mix the cream, cheese, and chopped walnuts together, then shape into small balls. Arrange the fruit on lettuce leaves and garnish with cream cheese balls. Sprinkle just before serving with French dressing.

Orange and Grape-fruit Cocktail.

Take 1 cupful grape-fruit pulp, 1 cupful orange pulp, 2 tablespoonfuls lemon juice, caster sugar to taste.

Cut the fruit into neat pieces, and mix together. Sprinkle with caster sugar and lemon juice and put in a cool place. Just before serving, fill the glasses with the fruit and place a glace cherry on top. Serve very cold.

Orange Sauce.

Take 1 cupful orange juice, 1 teaspoonful grated orange rind, 1 cupful caster sugar, juice 1 lemon, grated rind ½ lemon.

Cook all the ingredients together for fifteen minutes. Skim, cool, and serve with vanilla ice cream.

PLATE 315.
A FOREST SERVICE LOGGING ROAD.

With the development of mechanical haulage road improvement work becomes necessary and profitable. The Forest Service expended £12,360 in this direction in 1934-35.

[*Photo. by J. A. Lunn.*

Plate 316.

A Glimpse of Lake Barrine National Park.

Three National Parks (including Lake Barrine) were gazetted in the course of the year, bringing the number up to 40, totalling 335,892 acres.

[*Photo. by courtesy Telegraph Newspaper Co. Ltd.*

Orchard Notes for January.

THE COASTAL DISTRICTS.

ALL orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containig no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early-ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January, there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and over-ripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit; to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit, of even quality and even colour, in a case and packing it so that that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why "spoil the ship for a ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1.) That the fruit must be fully developed, but yet quite firm when gathered.

(2.) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3.) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4.) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare

market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket, and would have been better off had he not attempted to market it.

If spraying with arsenate of lead and systematic bandaging has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities, potatoes may be sown but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both ''grain'' and ''saccharine'' sorghums may still be grown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping ''layout'' to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

MEAT PROBLEMS.

Lecturing to the members of the Metropolitan Branch of the Agricultural Bureau in Sydney on 14th November on the subject of ''The Meat Industry of the World,'' Mr. Edmund Burke, of the Newcastle Abattoir Board, made the following points in dealing with the Australian situation in relation to world progress:—

The intensive publicity on the subject of meat production is being so well handled by the Empire Press that reports from all Dominions indicate definite progress in dealing with the problems of correct breeding and better feeding.

The initiative inborn in the stockmen of Australia, properly backed by constructive planning, will surely place this branch of agriculture well in the forefront of world quality within the next few years.

The differences in agricultural policy in dealing with the production and marketing of beef, mutton and lamb, and pork will give scope for the co-operation of the small farmer with the large breeder.

Australia's problem is as much one of transportation for inland development as it is for marketing.

Smaller subdivision in relation to a vast extension of water supply will be the means of giving quality as well as continuity of supply its much-needed assistance.

Railway transport in the many extensive yet slightly developed areas is a national matter of grave importance, and the surest incentive to a vigorous increase in national population.

All parties to the meat industry in Australia—producers, distributors, and consumers—must be brought into line in their mutual interests if Australia is to speed up development.

Properly used by means of better pastures, water, and transport, Australia lacks nothing that others have, but is blessed naturally by a climate that is becoming world-famous.

The growing youth of Australia will be proud of its agricultural achievements, and keen to join in the work if he is kept informed of the marvellous developments in scientific agriculture.

There is, notwithstanding a fierce economic nationalism to-day, a ray of hope that the world's demand for bread and meat will be so insistent that it must be met.

Agricultural development in Australia, with its call to human happiness, if made known to the citizens of Great Britain, will be the most popular public policy of the twentieth century.

In our plea for better stock, let us be convinced that pedigree grasses are just as necessary to Australia as pedigree stock if we are to give ourselves and the oversea markets the best of quality in the most economical way.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.,	No. of Years' Records.	Oct., 1935.	Oct., 1934.
North Coast.	In.		In.	In.
Atherton	0·92	34	1·75	0·91
Cairns	2·11	53	5·47	1·26
Cardwell	2·07	63	2·99	2·10
Cooktown	1·05	59	0·77	1·37
Herberton	0·98	49	1·46	0·58
Ingham	1·95	43	1·73	1·99
Innisfail	3·20	54	9·94	3·03
Mossman Mill ..	3·04	22	5·55	3·62
Townsville	1·37	64	0·19	0·40
Central Coast.				
Ayr	0·96	48	0·08	0·30
Bowen	1·04	64	0·05	0·44
Charters Towers ..	0·72	53	1·53	0·91
Mackay	1·70	64	2·53	3·65
Proserpine	1·70	32	0·12	0·89
St. Lawrence ..	1·78	64	2·73	2·06
South Coast.				
Biggenden	2·43	36	3·44	3·39
Bundaberg	2·12	52	1·40	2·89
Brisbane	2·57	84	4·93	1·34
Caboolture	2·51	48	4·18	1·94
Childers	2·72	40	3·19	3·87
Crohamhurst ..	3·27	42	4·92	2·22
Esk	2·51	48	3·61	1·76
Gayndah	2·41	64	2·20	3·26
Gympie	2·71	65	3·34	2·66
Kilkivan	2·63	56	1·88	3·55
Maryborough ..	2·79	64	1·94	3·88
Nambour	3·06	39	5·64	4·81
Nanango	2·24	53	4·24	1·47
Rockhampton ..	1·80	64	0·74	3·21
Woodford	2·54	48	4·60	1·60

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.,	No. of Years' Records.	Oct., 1935.	Oct., 1934.
Central Highlands.	In.		In.	In.
Clermont	1·33	64	1·04	2·09
Gindie	1·41	36	..	3·11
Springsure ..	1·66	66	2·14	2·74
Darling Downs.				
Dalby	2·06	65	1·72	1·45
Emu Vale	2·21	39	2·17	2·98
Hermitage	1·91	29	2·15	2·26
Jimbour	1·89	47	2·32	1·33
Miles	2·05	50	2·34	2·62
Stanthorpe	2·57	62	1·89	3·98
Toowoomba ..	2·56	63	3·89	3·12
Warwick	2·31	70	2·91	2·53
Maranoa.				
Roma	1·77	61	2·72	2·64
State Farms, &c.				
Bungeworgorai ..	1·50	21	..	2·75
Gatton College ..	1·99	36	2·81	1·95
Kairi	1·02	21	..	0·59
Mackay Sugar Experiment Station	1·41	38	2·62	2·14

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·93	85	70	89	26	67	2	77	4
Herberton	..	80	59	91	23,24,31	45	31	146	8
Rockhampton	30·04	86	66	101	29	60	1, 3	74	5
Brisbane	30·08	79	61	91	23	55	3	493	11
Darling Downs.									
Dalby	30·04	82	55	91	29	41	6	172	7
Stanthorpe	..	75	48	84	28	30	13	189	7
Toowoomba	..	75	54	88	28	43	6	389	9
Mid-Interior.									
Georgetown	29·92	96	71	105	31	63	30	52	2
Longreach	29·96	95	59	106	30	51	25	161	5
Mitchell	30·01	84	55	95	28	40	6	100	6
Western.									
Burketown	29·90	93	73	98	24, 31	64	2	77	2
Boulia	29·92	96	66	105	29. 31	55	6, 7	63	3
Thargomindah	30·00	86	61	103	28	49	13	192	3

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December. 1935.		January, 1936.		MOONRISE Dec., 1935.	MOONRISE Jan., 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	4·49	6·32	5·0	6·50	9·19	11·24
						p.m.
2	4·49	6·33	5·1	6·50	10·20	12·27
3	4·49	6·34	5·1	6·50	11·24	1·31
					p.m.	
4	4·49	6·34	5·2	6·51	12·26	2·33
5	4·49	6·35	5·2	6·51	1·29	3·37
6	4·49	6·36	5·3	6·51	2·35	4·40
7	4·50	6·36	5·3	6·51	3·41	5·38
8	4·50	6·37	5·4	6·52	4·49	6·29
9	4·50	6·38	5·5	6·52	5·52	7·23
10	4·50	6·38	5·6	6·52	6·54	7·53
11	4·50	6·39	5·7	6·52	7·48	8·27
12	4·51	6·39	5·7	6·52	8·38	9·0
13	4·51	6·40	5·8	6·52	9·20	9·31
14	4·51	6·41	5·9	6·51	9·55	9·59
15	4·51	6·41	5·10	6·51	10·27	10·30
16	4·52	6·42	5·11	6·51	10·58	11·0
17	4·52	6·43	5·11	6·51	11·27	11·34
18	4·52	6·43	5·12	6·51	11·56	
						a.m.
19	4·53	6·44	5·13	6·51	a.m.	12·10
20	4·53	6·44	5·14	6·50	12·28	12·55
21	4·53	6·45	5·15	6·50	1·1	1·46
22	4·54	6·46	5·16	6·50	1·37	2·42
23	4·54	6·46	5·17	6·50	2·17	3·43
24	4·55	6·47	5·18	6·50	3·6	4·48
25	4·55	6·47	5·18	6·49	4·0	5·59
26	4·56	6·48	5·19	6·49	5·1	7·2
27	4·56	6·48	5·20	6·49	6·3	8·10
28	4·57	6·49	5·21	6·49	7·9	9·13
29	4·58	6·49	5·21	6·48	8·14	10·19
30	4·59	6·50	5·22	6·48	9·17	11·23
31	5·0	6·50	5·23	6·48	10·21	12·29

3 Dec.	☾	First Quarter	5 28 p.m.
10 ,,	○	Full Moon	1 10 p.m.
18 ,,	☽	Last Quarter	7 57 a.m.
26 ,,	●	New Moon	3 49 p.m.

Perigee, 26th December, at 8.6 a.m.
Apogee, 18th December, at 12.42 p.m.
Perigee, 31st December, at 1.24 a.m.

At 5 o'clock in the morning of the 23rd the Sun will reach its extreme southern Declination, 23 degrees, 27 minutes south of the Celestial Equator. At midday it may be seen to light up the hearthstone at Rockhampton, wherever the chimney is perfectly straight. By the 31st the Sun will be distinctly on its way northward. A transit instrument will show that by that time it has returned a quarter of a degree on its long six months journey northwards of nearly 47 degrees.

A peculiarity of the month of December this year is that so many of the general phenomeua are of a negative character as far as Queensland is concerned. The last of the unusual number seven of eclipses will be over an hour and 34 minutes before the Sun rises at Brisbane on the 26th. Seldom does the magnificent phenomenon of an Annular Eclipse take place where there are fewer persons to enjoy it. Far down in the South Pacific Ocean spectators will be limited almost entirely to those on board ship. South America and New Zealand get merely a glimpse of the Sun being affected, but not of the golden ring. Those in the Altantic Ocean will be less restricted even to as near the equator as we are some indication of the eclipse will be possible. Mercury sets at 6.11 p.m., 21 minutes before the Sun on the 1st and at 6.49 p.m., only 8 minutes before the Sun on the 15th.

Venus rises at 2.11 a.m. on the 1st and at 2.13 a.m. on the 15th.

Mars sets at 9.57 p.m. on the 1st and at 9.44 p.m. on the 15th.

Jupiter rises at 4.39 a.m. on the 1st and at 3.54 a.m. on the 15th.

Saturn rises at 11.13 a.m. and sets at 12.12 p.m. on the 1st; on the 15th it rises at 10.19 a.m. and sets at 11.19 p.m.

When the Southern Cross comes into view about 10 p.m. on the 1st it will be about 15 degrees west of the Southern Meridian and will remain above the horizon till day-dawn. The same will occur on the 16th an hour earlier.

Phases of the Moon, Occultations, &c.

2 Jan.,	☾	First Quarter	9 12 a.m.
9 ,,	○	Full Moon	12 42 a.m.
17 ,,	☽	Last Quarter	10 36 a.m.
24 ,,	●	New Moon	12 36 p.m.
31 ,,		First Quarter	9 36 a.m.

Apogee, 15th January, at 9.48 a.m.
Perigee, 26th January, at 3.30 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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